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RESEARCH ARTICLE

The Illusion of Abstraction

Martha Lampland

University of California, San Diego, USA
Corresponding author. E-mail: mlampland@ucsd.edu

Abstract

This article constitutes a critique of abstraction as an analytic tool. The argument advances the idea that formalizing practices are indexical; that is, the way abstractions are realized necessarily incorporates features of the context in which they are produced. The expression formalizing practices refers to a series of actions or operations that make quantification, rationalization, and standardization possible. Entailed in all these procedures is an attempt to select and isolate features that exemplify a specific phenomenon or social process, or in the case of standardization, that stipulate its contours and dimensions. These features are presumed to be immanent from the start, but in fact, formal representations are carefully crafted, finely tuned instruments. In order to clarify these practices, I delineate three phases of their construction: the conceptual phrase, the choice of analytic strategy, and the specification of its formal representation. In other words, this approach suggests the value of examining formalizing projects as crucibles where cultural assumptions and practical reasoning are condensed into formulae. These ideas are explored in relation to the use of time and motion studies employed in early socialist Hungary to determine the new socialist wage system. While a decidedly local story, the implications of the analysis are much broader. The possibility of adopting this approach to the study of other formalizing practices, such as algorithmic systems and digital databases, is suggested. The analysis also raises questions about the commensurability of long-held concepts in social theory.

Keywords: abstraction; formalizing practices; labor power; wages; quantification; socialism; Hungary; time and motion studies

Introduction

Abstraction is an illusion; it plays tricks on us. The elegance of concise numerical and graphical representations—mathematical formulae, charts, and graphs—has beguiled us into the belief that quantitative indices are free-standing tools, referents that have cut ties with the cultural and social practices they are meant to represent. I will argue that, on the contrary, numerical indices and graphic representations are chock-full of social actors and practices, whose participation in formalizing practices has been eclipsed by the apparently pristine image displayed in their stead. Granted, a crowded stage can detract from our ability to see distinctive features hidden in the

midst of the throng, warranting a step back to gain perspective. We must not forget, however, that the features we illuminate characterize the crowd as a whole, not only discrete portions of it. In other words, if we neglect to analyze the construction *ab ovo* of pictorial exposition and quantified indicators, we are apt to mistake the numbers as sufficient for the reality they are meant to convey. The dense social and cultural precepts that are the scaffolding on which numbers are built are obscured, veiled in the shadow of the image.

My argument is simple: formalizing practices are necessarily indexical; that is, crafted for specific purposes in particular places. The general thrust of the argument is well known in studies of technology transfer (e.g., Breslau 1998; Collins and Evans 2009; DiMaggio and Powell 1991). It is also a cornerstone of Science Studies, where the mantra "science is local" is frequently articulated. Scientific practices conducted in the lab or in the field cannot lay claim to universal applicability in their initial form simply by virtue of their local imprint and the vagaries of experimentation (e.g., Henke 2000; Livingstone 2003; Powell 2007; Smith and Agar 1998). Only by devoting extensive time and energy to demonstrating the broader relevance of an idea or process are scientists able to convince their colleagues that their claims are valid. In the language of Science Studies, facts must be stabilized; acquiring the imprimatur of universal truth can be a decades-long process. So too, with the adoption of technology in novel sites, the end product always ends up being homemade. No matter how many components of the process are borrowed—metric units, equipment, machinery, modular forms—the final assemblage is tailored to the context because the social process of its construction is limited in space and time. In short, the sociocultural and historical conditions under which formalizing practices are implemented leave their mark. When studying formalizing practices, therefore, it is incumbent on us to begin at the beginning.

Excavating the founding assumptions of a formalized structure and exposing the rationale behind its design allows us to understand the initial conditions under which it was crafted. Only in these circumstances is it possible to ascertain just what a symbol was intended to express. Once depicted in numerical or graphical form, however, the subtle contours of the original argument are easily forgotten. To connect the dots between conception and representation, then, requires a careful examination of the steps taken in the deliberative processes that lead from one to the other. In other words, I want here to shed light on the pragmatics of formalizing practices. By tracing the original indexical referents of formal systems, by explicating the reasoning that led from messy reality to concise model, I can explain how and why ostensibly similar projects may in fact represent divergent phenomena. Being attentive to the social and cultural complexities of formalizing practices also gives us the ability to intervene more effectively in the design of formal systems by subjecting initial deliberations to greater scrutiny.

I offer the following account to illustrate how subjecting formalizing practices to careful examination proves worthwhile. To do so, I recount the introduction of time and motion studies into wage calculations in socialist enterprises in 1950s Hungary. Already a well-known technique in industrial engineering circles, time and motion studies had been experimented with for at least twenty years. There was no reason to expect the design of the technique would be altered. In fact, however, Hungarian work scientists insisted on including an additional metric in the design of time and motion charts: a measure of the exertion required to complete a task. This alteration was motivated by a distinct understanding of the value of labor, one that diverged

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from that held in Anglo-Saxon countries. I then proceed to describe the manner in which workers responded to these policy innovations and demonstrate that their criticisms of the new wage system had more to do with the accuracy of the calculations than any disagreement about their initial premise. We may be tempted to shelve the quaint history of socialist wage determination alongside other histories of a bygone era, but I think the basic point about the indexicality of formalizing practices has much wider applicability.[1] I contend that a more sustained examination of the initial conditions under which formalizing practices are devised could be more effectively pursued by distinguishing between the initial process of conceptualization, analytical strategies to express that view, and the specific forms that come to represent components of the model, all of which constitute a formalizing practice. This, after all, is the core of formalizing practices: condensing sociocultural beliefs into a formula. So, by observing the *doing* of formalization we can learn the intentions underlying the design and appreciate the contingencies of its construction. This insight applies as much to the study of algorithms and digital databases as to classic examples of formalizing practices like scientific management practices and product standardization. First, though, a few clarifying remarks on abstraction, formalizing practices, and indexicality.

Abstraction, Formalizing Practices, and Indexicality

I began this essay by suggesting that the term "abstraction" is misleading, and I substituted instead a notion of formalizing practices. Let me now clarify my position. Abstraction is an indispensable tool of analysis. By isolating elements, it becomes possible to identify crucial links or explore relational dynamics easily lost in the morass of empirical detail. Trees and the forest, as they say. My point, though, is that trees are not uprooted when we apprehend the forest. They remain firmly in place, rooted in the ground from which they first took sprout. So too, the initial conditions under which formalizing practices are designed, the founding assumptions on which they are constructed, shape the contours of the graph or algorithm or chart that is meant to express their import. The numbers that grace a graph or inhabit a formula may be meaningful beyond their use as abbreviations to compare with other similar values, but only if the phenomenon under consideration meant the same thing at its inception. Figuring out the initial meaning of numbers or signs in a formula is difficult, and it takes time and effort to learn what was meant at the time and why. To understand a forest, we cannot ignore the soil from which it grew, blithely marveling in the green canopy overhead.

I have coined the expression "formalizing practices" to refer to a series of actions or operations that make quantification, rationalization, and standardization possible (Lampland 2010). Entailed in all these procedures is an attempt to select and isolate features that exemplify a specific phenomenon or social process, or in the case of standardization, that stipulate its contours and dimensions. These features may be represented visually in a graph or equation, for example, or enumerated in a list of best practices. We discuss these features as their formal properties, as if the figure

[1] In earlier work, I have discussed formalizing practices in relation to processes of standardization (Star and Lampland 2009), the pragmatics of quantification (Lampland 2010), and the commodification of labor (Lampland 2016).

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were immanent from the start. In fact, though, formal representations are carefully crafted, finely tuned instruments. By describing these procedures as formalizing practices rather than simply as a process of abstraction, I want to draw attention to the activities entailed in realizing formal structures, procedures that tend to be overlooked as incidental rather than constitutive. In other words, I aim to connect the dots between the whisper of an idea and the fully articulated schema designed to analyze it.

Restoring the connection between social worlds and their representations brings me to the notion of indexicality. My use of the term "indexical" is drawn from linguistic anthropology.[2] "The term *indexicality* refers to the pervasive context-dependency of natural language utterances, including such varied phenomena as regional accent (indexing speaker's identity), indicators of verbal etiquette (marking deference and demeanor), the referential use of pronouns (I, you, we, he, etc.), demonstratives (this, that), deictic adverbs (here, there, now, then), and tense" (Hanks 2000: 124). Bar-Hillel stresses the important pragmatic role indexical expressions play in everyday speech, arguing that indexical expressions are "indispensable for effective communication" (1954: 369). It is nigh impossible, if one wanders into the middle of any conversation, to figure out what people mean to say when using recurring terms like this, she, or when without asking for further clarification. The same is true for numbers, whose provenance may be unspecified. We know, of course, that the status of numbers displayed in formulae, charts, and graphs refer back to the initial context of their calculation. They may form the basis of comparison with other data sets or become incorporated into other formal representations. They may even undergo recalibration. The point, however, is that the initial import of a number or picture or symbol may influence the character of later representations, and it is to this we must attend. In other words, the term "abstraction" implies that the practices of quantifying or standardizing remove extraneous elements. I argue, on the other hand, that formalizing practices—the practices engaged in to *produce* an abstraction—instantiate social relations. A whole range of assumptions about the social world—the meaning of specific behaviors, the relationship between various elements, the significance of some features over others—inform classificatory projects. These structuring principles do not disappear, but only fade from view. This explains how quantifying and standardizing projects that resemble one another structurally may in fact analyze entirely different phenomena. More importantly, recognizing the indexicality of formalizing practices means that innocent (tired) claims about technical neutrality can no longer hold. Time and again, earnest attempts to overcome the unfortunate handicaps of earlier practices have consistently fallen short, because the very structuring principles of the design have remained unexamined, thereby sustaining structures of inequality. If we begin at the beginning, then a clearer understanding of the entire conceptual edifice may be gained, giving us a better chance of eliminating the pernicious prejudices that permeate many formalizing practices.

It is not easy to demonstrate the social and cultural impact of the origin stories of formalizing practices. Evidential through lines may no longer exist or be obscured in "the cascade of successive representations" (Latour 1987: 235) that flow from the

[2]See, for example, Hanks 2000; Silverstein 2003. See also Bar-Hillel 1954; and Burks 1949.

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initial formulation.[3] Insisting that context matters flies in the face of the widely held assumption that the meaning of numbers is fixed. This conviction explains our trust in numbers, even though in our everyday experience we bandy them about in all manner of ways. They inhabit business reports, social policy documents, economic forecasts; they have been arrayed in formal patterns to inform and often to persuade. Swept up into rhetorical flourishes, numbers and other pictorial representations seem to float in the air. The further they travel, the harder it becomes to pinpoint their birthplace. Yet, distance from home does not lessen the import of origin stories. To determine the conditions under which a practice was devised, and trace their impact, is difficult and time-consuming.

Here I will propose a strategy to illuminate the backstage work of formalizing practices. I assert that we distinguish between three aspects of formalizing practices: formulating an idea, figuring out the best of means of analyzing it, and deciding how to depict the analytic task formally. We might refer to these as the conceptual phrase, the choice of analytic strategy, and the specification of its formal representation. Disambiguating the tasks this way lets us examine more rigorously how the contingencies of place and time influence the conceptual work being done. Hence, what we discuss in terms of epistemological and pragmatic constraints shaping formalizing practices can be understood also as deeply invested cultural projects.

The conceptual phase refers to the initial set of assumptions that set the terms of analysis. In an academic exercise these may be well articulated theoretical premises or a reconfiguration of accepted principles that prompt a question. Other times, it may be the less explicit but no less important quotidian imaginaries that are shared within a community. Whatever the case, these assumptions must be carefully examined to disclose the parameters stipulated in a concept. This is not always straightforward or easy to discover. As the example of time and motion studies in Hungary will show, figuring out why the standard procedure of time and motion studies had to be altered forced me to delve into the technical minutiae of measuring work, which might otherwise have been dismissed as minor details. Understanding these specific features led me to investigate the social historical conditions under which the initial set of assumptions about work were forged, and thence to discover that divergent social histories of capitalist production within the European continent explained why distinct conceptualizations of labor existed. Identifying the conceptual phase of formalizing practices therefore entails more than tracing a line in the sand; it demands a survey of the landscape.

The second phase of formalizing practices refers to the complex task of deciding upon an analytic strategy. One might think of this as the process of constructing a model, with the understanding that a model is a tool to isolate the features of a phenomenon and gauge their relative significance. This is not a one-off strategy, but a recursive practice reconfiguring elements to determine the most effective approach (Edwards 2010). Mary Morgan's masterful account of "how economists work and think" helps to illustrate this process. She distinguishes four different ways in which economists "'give form to' ideas: namely as a process of recipe making, of visualizing, of idealizing, or of choosing analogies" (2012: 20). In every instance, designing a

[3]Latour refers to these formal representations as inscriptions. A cascade of inscriptions, then, is constituted by the series of procedures that render—in Latour's terms, translate—empirical data collected in the lab or from the field, into increasingly concise and dense depictions of the processes under investigation.

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model requires carefully considering the strategy for how one would go about assembling all relevant elements of the problem and then conceptualize their dynamic interaction. Morgan's category of models as recipe making draws from the work of the philosopher and historian of economics, Marcel Boumans, who likens model building to baking a cake without a recipe, assembling various ingredients to create a novel confection (1999). To illustrate, Morgan (2012: 21) cites the work of Ricardo, describing how he integrated information culled from numerous farm accounts to construct a general model of the agrarian economy. Building a model on an idealized scenario is a familiar technique, exemplified by Weber's notion of an ideal type. The strategy of choosing analogies in Morgan's categorization refers to adopting "an abstract conceptual idea associated with particular mathematical forms and computational methods" (Knuuttila and Loettgers 2016: 379); the Ising model is prime example. Designed initially to study phase transitions in ferromagnetism—"a general cooperative mechanism leading to clustering and phase transitions" (ibid.)—it was eventually adopted for studying a variety of other phenomena in physics and chemistry, and even the social sciences. Since the analogy lies between "particular mathematical forms and computational methods" being applied, it should be clear that the phenomena to be modeled do not need to resemble those for which the initial model had been developed.[4]

Time and motion studies fall into Morgan's category of models as a visualizing technique, which renders ephemeral processes into a visible pattern. Common examples are charts or graphs with x and y axes. In the case of time and motion studies, the goal was to capture the subtleties of movement sufficiently to identify discrete components of the action being taken, such as the arc of pounding an anvil or the angle of sawing wood. In pursuit of more scientifically rigorous examination of time and motion at work, the Gilbreths invented the chronocyclograph to make a worker's actions more discernible and traceable to the human eye: "The device for recording the path of the motion consisted of a small electric light attached to the forefinger or other moving part of the body of the worker.… An ordinary photographic plate or film was exposed during the time that he performed the work and recorded the motion path described by the light as a white line" (1917: 83). The temporal duration of these movements was tracked "by placing an interrupter in the current, that transformed the white line of the cyclograph into a series or lines of dots and dashes" (ibid.: 84).[5] The photographs produced in these experiments steered the design of more efficient, less fatiguing bodily postures at work. The Gilbreths' used the chronocyclograph in a variety of work settings, most notably in industrial factories. Less known are their motion studies intended to enable crippled soldiers to return to work after World War I (ibid.: 131–57) and their work at the Society of New York Hospital between 1912 and 1917 with surgeons who proved enthusiastic

[4]An example from the work of algorithmic design is the adoption by criminologists of models drawn from earthquake science. Ruha Benjamin cites PredPol, which is an algorithm designed to predict the incidence of crime in discrete locations across the city (2019: 82–83). Earthquake models were chosen because they predict the sequence and location of aftershocks—referred to as cluster events and self-exciting point processes—which have served as the analogy to estimate the timing and spatial range of crime patterns (see also Mohler et al. 2011).

[5]The design of the chronocyclograph harkens back to the original set of graphic notations developed by Étienne Marey in his studies of the physiology of time in the 1870s and 1880s to "decipher the language of duration within the space of the body as well as to map the body in space" (Rabinbach 1992: 94).

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participants in the research (Gainty 2012). This is the scientific pedigree of time and motion studies, not the clumsy work Taylor foisted on the world.

Choosing an analytic strategy is a conceptually difficult, labor-intensive task. As Morgan explains, model-making is a deliberative, self-conscious exercise—a "skilled job." "Forming models is not driven by a logical process but rather involves the scientist's intuitive, imaginative and creative qualities … learning how … to make the model work are specialised talents using a tacit, craft-based, knowledge as much as an articulated, scientific knowledge" (2012: 25). Needless to say, all of these activities are decidedly social. Intuition and imagination are culturally and historically bounded, craft must be taught and practiced, and scientific knowledge must be acquired. Training our attention on the analytic work entailed in formalizing practices gives us greater purchase on the complicated political and social dynamics involved. A hollowed-out notion of abstraction leaves all of this out of the picture.

The third phase to consider is the way elements are characterized and depicted formally, for example as a chart, table, diagram, or drawing populated with words, numbers, arrows, or other visual tools to aid comprehension. We learn to read the logic each form presents: columns to be read horizontally, lists to scroll through vertically, equations to work through, lines connecting dots to follow across the surface of a graph. The symbols arrayed across the page play various roles: as narrative descriptors, points of convergence, or characters in a model. For example, calculating a statistical probability involves combining various elements stipulated by the analytic strategy—variables—in pursuit of a provisional explanation. Variations of the model are often depicted in a succession of tables or graphs to demonstrate the results of various combinations. A classic example would be a statistical study of class mobility. Variables such as age and years of schooling are straightforward descriptors. With regard to other aspects of the analysis, a proxy must be chosen—a stand-in, a substitute for the process being represented (see Chun 2018).[6] In other words, an index. As a stand-in, a proxy denotes a crucial feature of the phenomenon under investigation that is underspecified descriptively. So, in a study of class mobility, father's education may be chosen as a proxy for class, based on the assumption that occupations and income are correlated with level of education. Another proxy might be a zip code, which denotes the location of specific social groups within a community. In time and motion studies, disarticulated actions are described explicitly, say screwing in a widget or moving a heavy box up an incline, but the crucial variables of frequency and temporal duration are represented in numbers. The innovation Hungarians introduced was to include a column listing the effort expended in a specific task or movement. Each component of the table thus designed is a conscious choice, and its depiction crucial. To fully understand the meaning of proxies and variables in any specific application demands attending to the "person behind the curtain"; that is, what processes or elements are being spoken for and why. When chosen, proxies and variables meant something, they had a purpose in the analysis, which is not always made explicit.

[6]It is tempting to think that proxy is etymologically related to the term approximation, but in fact the *Oxford English Dictionary* characterizes it as derived from the term procurator, as in an official agent or manager. It defines proxy as "the agency of a person appointed to act in place of another; the action of a substitute or deputy."

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How a proxy or variable was selected reveals the reasoning behind the choice, leading us once more to the social and historical context of its production.[7]

By enumerating three stages of formalizing practices—what I refer to as the doing of formalization—I will demonstrate how one might go about filling in the picture that the image of abstraction leaves out. Every phase of the process of designing a formalizing practice requires careful deliberation and specific skills. Moreover, these are tasks that are bounded in time and space. In other words, they are culturally and historically contingent. These conceptual constraints are just as true for the design of algorithms as they are for time and motion studies, as numerous authors have pointed out (Beer 2017; Bowker 2000; Loukissas 2019; Radin 2017; Seaver 2015; and Vertesi and Dourish 2011). Recent work developing techniques for tracking the who and the where of algorithmic design—"datasheets for datasets" (Gebru et al. 2018)—is intended to rectify the absence of valuable contextual information by keeping track of the progress of a design (see also the work on data packaging and data journeys: Bates, Lin, and Goodale 2016; Leonelli 2009; 2011). These efforts are clearly invaluable, but they fall far short of a sustained social analysis of the day-to-day work of fashioning a study of "movement in space" (either by Marey or the Gilbreths) or creating algorithms for discrete tasks (see Passi and Barocas 2019 as an exception). What challenges did people face in devising a model to suit the task at hand? How were problems resolved? Why were some paths taken and not others? How was this project different from projects elsewhere that may appear similar, but where the resemblance is only superficial? Without interrogating the work invested in the process of formalizing itself, we cannot recognize the degree to which local conditions have played a role and in what ways.

Rationalizing Wage Systems as Formalizing Practices

To illustrate how one would go about beginning at the beginning, I offer the following account of attempts to devise a scientifically sound wage system during the Stalinist era in Hungary (1948–1956). Much of the history I have to recount is well known, but important details have been overlooked that complicate our understanding of how wage labor calculations were conducted in this period. The crux of the issue concerns distinct theories of labor power in Anglo-Saxon and Central European communities, notably divergent conceptions of how value is constituted in work. I realized the significance of this discrepancy when I noticed that time and motion studies performed in socialist enterprises had been tinkered with in order to accommodate Hungarians' particular conception of labor power. This need to amend a standardized practice serves as a preeminent example of the indexicality of formalizing practices—modifying a standard practice to suit the context-specific meaning of a formula so that the numbers and symbols represented local cultural understandings.

The Communist Party in Hungary wrested full control of the government in 1948 and proceeded to expand the substantial infrastructure of state planning inherited from the war into a more comprehensive system of socialist administration.

[7]See Eubanks for an example of proxies for child maltreatment used in an automated (digital) program to screen families by a county office in Pennsylvania overseeing children, youth, and family welfare (2017: 143–44).

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Short-term goals of nationalizing heavy industry and banking were paired with long-term goals of redesigning the wage structure. Conducting time and motion studies of every phase of work performed in the people's economy was one component of this plan. In the early 1950s all state-owned enterprises were required to submit documentation demonstrating that they had conducted time and motion studies, along with their results (floor plans, depictions of movements, disarticulation of tasks, etc.).[8]

The foundational handbook of time and motion studies in Hungary, *Munka- és Időelemzés* (Work and time studies), was published in 1949, the culmination of several decades of research conducted by Hungarian work scientists inspired by the German field of *Betriebswirtschaft* (study of the firm) and psychotechnique (for example, Erdélyi 1936; Gárdonyi 1933; Hatvani 1935; Szakáll 1943; Ujlaki Nagy 1943). Two research institutes devoted to work science—one in industry, one in agriculture—were established in the early 1940s, then combined after the war into the Work Science and Rationalization Institute.[9] The institutes' mandate was to develop procedures to increase productivity and efficiency in capitalist enterprises; these tasks were easily adopted for the new socialist regime. This was so not only for pragmatic reasons since the scientific aspirations of work science and industrial engineering harmonized perfectly with the avowedly scientific world view of Marxism-Leninism.

In the first years after World War II, economists weighed in with treatises on the scientific construction of wage systems, arguing that determining wages entailed a theoretical and mathematical synthesis in which base rates and hourly wages could be figured out by formula "with mathematical precision" (Hegedüs 1947: 36). Science would cut out the middleman of everyday wage calculations: the shop floor boss and his prejudices. Scientific wages would be fair wages. Yet the enthusiasm the Communist Party expressed about designing scientific norms faced a conceptual obstacle: piece-rate wages were demonized in capitalism, seen as the preeminent tool for exploiting workers. How, then, would piece-rates function differently in socialism? This fine point of exegesis was articulated in a variety of venues. Here I paraphrase the argument from an essay penned in late 1950 for the Agricultural and Cooperative Agency in the Communist Party apparatus.[10] Piece-rates in socialism and capitalism differed in several crucial ways. In socialism, workers were paid for their contribution to production, whereas in capitalism, wages were set by the laws of supply and demand, severing the connection between effort and reward. Moreover, the ability to extract profit in capitalism depended on the private ownership of the means of production. Having seized the means of production under socialism, workers could work for their own benefit rather than enrich the bourgeoisie. Of course, being responsible for the common good meant that a sizeable portion of workers' contributions would be channeled to sustain public infrastructure and the growth of the economy as a whole, reducing the size of their paychecks substantially. Finally, by constructing piece-rate systems that were difficult to decipher, capitalists were able to

[8]The source materials I rely on are restricted to the agricultural sector, specifically state farms and the various national enterprises—experiment stations, specialty crop cultivation—run by the Ministry of Agriculture.

[9]Staff preferred to refer to the institute as the Work Science and Irrationalization Institute. Politikatudományi Intézet Levéltára (PIL) 274 f. 12 cs., 16 ö.e., pp. 1-4, 9-12.

[10]MOL 276 f., 93. cs., 373 ö.e., pp. 207–9. Magyar Országos Levéltár (MOL) 276 f., 93 cs., 373 ö.e., pp. 207-9.

extract profit easily. The only way to ensure that workers could identify their interests with those of the state would be to make the calculations transparent. To achieve this goal, time and motion studies would have to be performed.

Time and motion studies were initially designed to disarticulate tasks into a simple series of gestures and bodily stances. Each component would be timed, and then efficiencies in movement and effort would be identified to speed up the process. In the United States, productivity would be measured by the increase of output/time expended: how many more widgets could be produced per hour or day. The design of time and motion studies in Hungary during the socialist period shares many of the same features. A range of tasks were dissected into a series of actions, which were then measured according to the amount of time it took to complete each one separately, and finally combined to judge the actual length of time for each task. There is one crucial difference, however, between U.S. and Hungarian designs. In Hungary the value of labor was defined in terms of the activity performed (labor power), not the output produced as is common in the United States. In short, effort expended to produce output was the measure of value, not output alone. In order to explain the difference in the meaning of labor—evidence of the indexicality of formalizing practices—a short detour is required.

The Value of Labor

In a valuable comparative study of labor regimes in British and German wool factories in the mid-nineteenth century, R. Biernacki argued that a range of practices we associate with industrialization—the design of factories, concepts of efficiency, the character of social movements—showed distinct cultural differences (1995). These differences included how wages were calculated. The measure of textile workers' contributions to production was defined differently in the two countries. In Britain, workers were compensated for the amount of yardage they produced in a shift; German workers were compensated for the actual movements of weaving itself—how often they had shuttled the loom back and forth in the course of a day. In other words, in Germany workers' labor power was rewarded, whereas in Britain workers' output mattered. Biernacki explains the differences on the basis of divergent social histories. In simplistic terms, betraying Biernacki's complex and subtle analysis, one could say that in England, the history of marketing textiles long predated the rise of wool (and cotton) manufacturing, so defining labor in terms of the product sold in the public square made sense. In contrast, a different concept of production and labor had arisen in Germany. Among several other factors, Biernacki singles out feudal agricultural estates as forming the model on which factory production would grow, not cottage industry as in England. Feudal obligations, abolished in 1807 but continuing de facto until mid-century, left a strong imprint on labor relations, contractual forms of servitude that were absent in England and most of Western Europe by this time (Brenner 1976). Hungary shared this legacy, abolishing feudal servile duties only in 1848.

This focus on labor as the "doing of work" also informed Marx's analysis of capitalist production, in which he translated this cultural notion of labor power into a crucial analytic wedge prying open the intricacies of British capitalism.

> Marx himself believed that his greatest contribution to economic analysis lay in his elucidation of the sale of that singular asset he called *Arbeitskraft*, 'labor

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> power.' The locution indicated that workers transferred not just 'labor' to their employer, but the use of their labor capacity…. Marx's expression *Arbeitskraft*, it turns out, was adopted from colloquial German speech, although its equivalent in English, *labor power*, sounds stilted and bookish even to the academician's ear. In Germany the term functioned in the language of the streets as a description of wage labor long before Marx penned it in an economic treatise (Biernacki 1995: 42).

The term *Arbeitskraft* or labor power (*munkaerő*) was also in wide use in mid-nineteenth-century Hungary. Complaints about a dearth of labor power were common in the decades following the abolition of serfdom, voiced by aristocrats and wealthy landowners whose former serfs refused to work for them. László Korizmics, a prominent critic in the debates following the abolition of serfdom, made this point explicitly in the late 1860s. "In our opinion, it would surely be good for larger estates, even if they have the financial means to buy equipment, to think twice before setting up their farms as large estates. The major reason for this is that although it is difficult, one can still get labor power for land, while in many places labor power cannot be obtained for any price whatsoever…" (Vörös 1976: 68, quoted in original text; see also Kenessey 1868; and Kautz 1877). Biernacki strengthens his argument about the cultural origins of Marx's notion of labor power by tracing its use in the early drafts of the *Grundrisse* and *Capital,* offering evidence that Marx did not adopt the notion of *Arbeitskraft* from liberal German economists who had already been using it in this period. In fact, an early version of his notion was *Arbeitsvermögen* (labor capacity) (1995: 283).

Marx's thinking about labor power was also strongly influenced by groundbreaking studies in the fields of engineering and thermodynamics. Rabinbach cites from Marx's notebooks to *Capital*, demonstrating that he was familiar with the theory of machines from the work of Pelligrino Rossi, a political economist "who used in the late 1830s and early 1840s the engineering term '*puissance du travail*' [capacity for labor] propagated by Navier, Coriolis, and Poncelet, and other pioneers of hydraulics and mechanics" (1992: 79). In other words, energy was no longer understood to be a substance, but in fact a potential, a "capacity for labor." Rabinbach chronicles a shift in Marx's thinking about labor that mirrors this shift in scientific understandings. "Until 1857, Marx took as his model of nature the *metabolic exchange of substances and forces*, which reflected both the pantheism and the 'metaphysical' materialism of his generation.… After 1859, Marx gradually redefined labor from a metabolic exchange of substances between man and nature to a conversion of forces" (ibid.: 77). All this is to say that the distinct notion of labor power—evident in the work of Marx and later in the structure of Marxist-Leninist wage structures in Hungary—is closely connected to crucial conceptual developments in the natural sciences of the nineteenth century and not merely some parochial artifact.

This Central European conceptualization of labor power also informed the fields of nutrition science and physiology at the turn of the twentieth century; that is, labor power was understood to be a capacity to labor or a force (energy). In his analysis of the research conducted at the Kaiser Wilhelm Institute for Labor Physiology, Milles identifies an important difference between the views of productivity advocated by Edgar Atzler in Germany and Frederick Taylor in the United States.[11] Atzler was of

[11]An unfortunate consequence of the U.S. focus on much of the study of scientific management is that Taylorism has been accorded a far more significant role in the history of labor physiology and work science

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the opinion that gains in productivity had to be assessed in terms of energy consumption and fatigue, a crucial element that he believed was absent in Taylor's insistence on maximum efficiency.[12] In the 1920s, "nutrition thus gained a key position in the basic concepts of German labor physiology and especially in its distinction from Taylorism. The analysis of energy consumption became the focus of this new orientation" (Milles 1995: 87). Max Rubner, another seminal figure in German physiology known for his research on calories, shared this focus with Atzler. Across the channel, a different approach focused on the role of minerals and vitamins in a daily diet. In his analysis of British efforts to reduce malnutrition after World War I, Weindling confesses to being puzzled by the Germans' continued focus on calories. "British and American nutritional scientists were markedly more innovative than the Germans who, like the physiologist Max Rubner, remained fixated on calories and the expenditure of energy" (1995: 319). Clearly, the difference was not indicative of a more progressive British science, but instead reflected divergent views about what sustained and nourished the body. German nutritionists and labor physiologists considered the expenditure of energy to be crucial to the human metabolism, hence their "fixation on calories." Hungarians shared this view. This helps to explain why Hungarians would see fit to alter the design of time and motion studies. When formalizing practices to measure the value of labor, Hungarians added a metric to reflect their understanding of what workers do; they expend energy. And so, measuring energy had to be incorporated into the formula; calculating output alone was insufficient. With this history in mind, it now becomes clear that the formalizing practices entailed in studying work in Hungary would be different from those conducted in the United States or Britain.

Socialist Policies on Time and Motion Studies

In the opening essay of the new journal, *Wage and Norm* (December 1950), a leading Communist economist, István Friss, argued that the study of wages and norms was essential to the building of socialism. Yet no one labored under the illusion that a precise norm system (*szabatos normák*) could be established overnight. "The proper system of wages … does not develop on its own. Its construction requires a lot of knowledge and study. We are nowhere near the level of knowledge … to be desired; it would be worthwhile to devote much time and energy disseminating it" (1950: 1). This was especially true in the agricultural sector, where payment in kind predominated.[13] These cautionary words were not heeded, however, when commands to pursue time and motion studies in each enterprise were handed down from the bureaucracy on high. State farm managers and research institute directors were expected to oversee the relatively simple task of breaking up a series of actions into discrete elements, timing them, and assessing their frequency in the process of

than is warranted. As Rabinbach has made very clear, work science in France and Germany in the latter half of the nineteenth century was a thriving research field on its own, independent of Taylor's projects in factory management (1992).

[12]In Atzler's mind, achieving maximum efficiency did not take workers' welfare into consideration. At the Kaiser Wilhelm Institute Atzler's goal was to humanize the workplace. "Atzler and his associates rejected the Taylorist principle of *maximum* output … and instead urged employers to adopt an *optimal* work design that would maintain and enhance the wellbeing of their labor force over the long term" (Campbell 1989: 145).

[13]MOL 276 f., 85 cs., 7 ö.e., p. 2; 30 Dec. 1948.

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production. This was followed by the more difficult tasks of assessing the intensity of work and figuring out the factors contributing to fatigue. Staff were also expected to calculate time wasted in the course of each task (Mártonfi 1949: 213). Of course, bureaucrats were not in possession of the Gilbreths' valuable chronocyclograph, so they simply observed workers' movements on the job. Once completed, reports were submitted to the relevant authorities, giving extensive descriptions of the time and motion studies they had performed, including tables with detailed measurements, and often also drawings depicting both the sequence of tasks and movements of actions on the shop floor or in the research lab.

In Hungary, the final norm was not only assessed in terms of time spent and frequency, as in the United States, but also in relation to the level of physical exertion it demanded, described as an exertion bonus or weariness factor (*fáradsági pótlék, tényező*). Time and motion specialists relied on charts listing a numeric value for the levels of exertion required to complete various actions, for example moving a mass of 1 kilogram or less by hand (1.06); opening and closing a door (1.08); screwing in a nut bolt 5 millimeters (1.08), 20 millimeters (1.10), or above 20 millimeters (1.12); and (my favorite distinction) standing ready alongside machines without doing physical labor (1.05) in contrast to standing alongside machines without doing physical labor but under supervision (1.08) (ibid.: 167–77).[14] Hence the temporal value of a specific task—a movement or action that constitutes only a portion of job overall—would be multiplied by the appropriate exertion factor. "One must use the exertion factor to ensure that workers are able to fulfill the norm equally, employing the same amount of effort, for tasks of varying difficulties" (ibid.: 167). A focus on exertion as the measure of work stands in stark contrast to the prevailing view in the United States at the time, where output was the sole consideration. Ralph Barnes, a prominent proponent of time and motion studies,[15] makes this clear. "The results of work determine its value rather than the effort exerted…. Accomplishment can usually be measured most effectively in terms of the quantity of work done per unit of time, that is, pieces per hour or tons per day" (1949: 323). The pioneering work in the study of fatigue by Gilbreth and Gilbreth also defined output as the best means of measuring activity. "The psychologists and physiologists who have measured fatigue rely solely upon output as the unit of measurement. Decrease in output in a comparable unit of time, and all other working conditions remaining the same, is taken as indicative being the result of fatigue" (1916: 115). In contrast, Mártonfi, the author of the definitive study of time and motion studies published in 1949, stated, "There is not a close connection between the decrease in output and actual fatigue. We usually say that *the reduction of output is not correlated with the objective measurement of fatigue.* In other words, the intensity of work usually doesn't lessen in proportion to the degree of actual fatigue present" (1949: 163). This distinction between what constitutes work, and therefore, what needs to be measured—output/time versus energy expended over time/output—replicates the difference Biernacki identified in wage systems in English and German factories. As a result, the design of time and motion studies in the United States and Hungary were built on entirely different principles.

[14]Mártonfi does not explain who designed these metrics. I assume they were calculated by work scientists in the 1930s who studied work from a physiological angle (see Erdélyi 1936; Gárdonyi 1933; Hatvani 1935; Szakáll 1943; and Ujlaki Nagy 1943.

[15]Barnes's book *Motion and Time Study* was initially published in 1937, but eventually reached six editions, the final version appearing in 1968.

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Unfortunately, this significant difference has been overlooked. When comparing time and motion studies in various countries, the apparent similarity of technique—the familiar table with columns detailing movements and their temporal duration—has led observers to assume that the terms of the analysis meant the same thing. As we see here that assumption is flawed. The initial cultural conception of labor, or more accurately in this case, laboring, constituted the basis on which new methods of measuring productivity were devised. No matter how formulaic the principles of time and motion studies had become in the repertoire of scientific management, they had to be altered to suit the context. Hence, a reconfigured calculus.

On the Shop and Barn Floor

Assigned the task of figuring out wages with "mathematical precision," work scientists and socialist bureaucrats now had to see the project through: conduct measurements, adjust calculations, set wage norms, and then put them into practice. Workers, however, felt no obligation to accept the norms foisted upon them. Refusing to work toward new production targets is very common among workers, wherever they may be found. The reasons for doing so may vary. Workers often took issue with the norms' inadequacies or distortions, not just with the pressure to produce more. I draw examples of these conflicts primarily from correspondence conducted between ministerial agencies and county officials or state farm personnel in the early 1950s,[16] and from Mark Pittaway's excellent scholarship on industrial workers in the early 1950s (2012). While some of the correspondence I examined was devoted to explicating new ministerial directives to local authorities, other missives were specific recommendations made to firms and farms based on reports submitted by inspectors sent by the ministry to oversee the progress being made (or more often not) in implementing new policies. Protracted correspondence could follow, as officials such as town clerks or state farm managers sought advice about how to go about making the changes recommended, doing their best to inform their superiors of progress along the way.

The most immediate response to the new policies was strike action. After the war, it had been customary for management to circumvent the strict wage caps stipulated in the collective agreement (union contract). At the Wolfner Leather and Shoe Factory, workers received two envelopes on pay day. The first of the two envelopes contained wages earned on the basis of the collective agreement at the factory; the second envelope "compensated workers for poor fulfillment of their production norms" (ibid.: 98). In November 1947, the Communist Party cell at the factory forced management to change payment practices as a prelude to broader changes in wage systems. The action was met by an immediate three-hour strike, which spread to other departments in the factory in the following week. Oil workers in Zala County also faced major changes in payment schemes in Autumn 1947, leading to widespread discontent (ibid.: 90–91). In both sites, the Communist Party blamed right-wing Social Democrats for the anger workers expressed at the loss of pay, and so dismissed complaints as illegitimate.

[16]I reviewed documents from both party agencies and state offices. Despite the Communist Party's overall dominance of decision-making in government bodies, the goals of party operatives and ministerial personnel did not always correspond (see Lampland 2016).

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Similar moves to alter pay schedules led to strikes among miners in Tatabánya in the first months of 1948. Miners simply refused to work for the new production targets. As the strike gained force, miners assembled in the soccer stadium to voice their anger at the Communist Party. The strike committee proposed a revised version of the collective agreement, which included, among other things, an increase in coal payments and a pay supplement for older workers. State security agents promptly arrested members of the strike committee and forced the others back to work. General discontent among the miners was attributed to reactionary elements—right-wing Social Democrats and fascists (ibid.: 108–9). But the Communist Party did take action to address some of the complaints, in order to maintain some semblance of legitimacy among miners who had been sympathetic to the Communists. In the coming months, the Communist Party also resorted to using time-honored tactics to lead workers' attention away from making demands on government agencies. "The MKP [Hungarian Communist Party] met with considerable approval when it attacked shopkeepers for having 'profiteered' against shoppers; it attacked those who gave 'loans' to workers at weekly rates of interest of sixty forints—thus using class-based rhetoric to channel anti-Semitic sentiment" (ibid.: 109).

Other examples of discord were more explicit challenges to policy recommendations leveled by workers and managers on the shop or barn floor. Alleging policies to be unworkable or wrongheaded, they proposed alternative metrics, accompanied by careful calculations. I divide the following examples into three categories: (1) complaints about the varying abilities of workers in the new system, (2) wage demands for time spent idling, and (3) discussions over the proper way to calculate energy expenditures in wage calculations. As will become evident, workers were primarily concerned about their laboring—their exertion on the job—not being fully acknowledged and properly remunerated.

The first category of complaints expressed concerns about the dangers of pitting workers against each other on the job. In a letter sent in the summer of 1949 to *Szabad Föld* (Free land),[17] a self-described Old Communist took issue with the idea of labor competitions being held at cooperatives and state farms. He had witnessed the corrosive effect of competition on worker morale before the war and was very concerned.[18] "Competition is harmful to the community and harmful to the individual. I know what competition is like. Men aren't the same, one is slower, the other more agile. That's why competition is bad, because the slow one can never accomplish what the more agile one does."[19] This is precisely the same concern Marx raised about the Gotha Program, which advocated the equal distribution of social goods among all in society. Since the physical and mental capacities of workers differ, Marx argued, distributing goods equally among all would introduce new sources of inequality. "But one man is superior to another physically or mentally and so supplies more labour in the same time, or can labour for a longer time; and labour, to serve as a measure, must be defined by its duration or intensity, otherwise it ceases to be a standard of

[17] *Szabad Föld* was the weekly newspaper published for members of cooperative and state farms.

[18] "Old Communists" were people who had been active in the Communist Party long before the Soviet invasion. Some could claim to having participated in the 1919 Soviet Republic, others fought in the Spanish Civil War, and others had been active in labor politics in the 1930s. They stood in contrast to Hungarians returning from exile in the Soviet Union and the Johnny-come-lately party members whose motivations in joining the party after the war had more to do with currying favor than with ideological conviction.

[19] MOL 276 f, 93 cs., 104 ö.e., p. 252.

measurement" (Marx, in McClellan 1977: 568).[20] The letter-writer warned that if collective production would rely on competitions, everyone would starve. Many villagers went hungry, but outright starvation was prevented by substantial government subsidies propping up cooperatives, whose pitiful performance lagged substantially behind the production levels of private landowners still farming independently.

The second category of complaints had to do with the belief among Hungarian workers that wages should be based on the time and energy expended while they worked, not simply on output. This attitude was reflected in the general belief that just being at work, even if one was forced to be idle for lack of materials, should be compensated.[21] As rampant inflation threatened their pocketbooks in February 1946, workers insisted they be paid for the time they spent at work, a principle they also expected to have codified in the collective agreement. Factory owners rejected this idea out of hand.[22] Government officials and local authorities could not dismiss these demands so cavalierly. The food ration in Budapest had been set at 556 calories, the lowest in postwar Europe (Lampland 2019: 14), meaning the physical stamina of workers was seriously threatened by meagre wages. This concern about unpaid time spent at work continued far beyond the dire circumstances of the postwar inflationary disaster in 1946. In a letter sent to the Department of Labor Affairs at the Ministry of Agriculture in January 1951, we find the following question: How does one calculate the wage paid to field workers who were prevented from working because of rain, specifically in the case of workers stationed hundreds of kilometers from home? [23] In other words, what are the metrics for calculating "waiting time" or "readiness time"?[24] In fact, when submitting reports detailing the results of time and motion studies, officials were required to display calculations for time lost at work, in addition to the exertion factor of each job.

Finally, the third category of complaints dealt with the specific calculations that government agents introduced to account for exertion over time. Workers in various enterprises easily came up with their own measurements of exertion, such as those provided by workers at the Quality Seed Cultivation Enterprise. "Stirring is done with a long handed wooden shovel, at which point 1.20–3 kilograms of product is thrown a distance of 2–3 meters.… The worker who is doing the stirring must complete 40–50 scooping movements … turning his body 120 degrees after every scoop. He then throws [the seed] up 1–2 meters with a sweeping motion." [25] In the loss time recommendation, they noted that after 5–6 minutes of stirring the seed, workers needed to pause until the dust settled, adding a significant amount of time to the loss

[20]Marx's description here of measuring labor in terms of duration and intensity is exactly the metric Hungarian work scientists used.

[21]As I have noted, the earlier discussion of exertion factors in Mártonfi's text included metrics for standing idle alongside a machine and a higher exertion factor for standing idle in the boss's presence. This means that calculations of the exertion factor included assessing one's emotional state; that is, in this case the energy expended when being surveilled by management.

[22]MOL XIX-A-10-1946.II.14.8 d.

[23]MOL XIX-K-1-j, 5. d, 8140-539.

[24]This same expression was used by German workers. "Drawing upon their view of employment as the commitment of the use of labor over time, German weavers [in 1906] argued that they had a right to payment for the period they spent waiting without working (*Wartegeld*)" (Biernacki 1995: 364). The payment of waiting time had become so widespread in the first decades of the twentieth century that Biernacki claims it served as the basis for workers' demands for paid vacation time (ibid.: 367).

[25]MOL XIX-K-1-j, 1 d., 8140-20-5.

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factor as it had been calculated previously. Management responded to this concern by adding a 20 percent bonus for the exertion factor and a 10 percent bonus for the loss time factor. Similar care was taken by the Mushroom Cultivation Enterprise when contesting the classification of certain jobs and their rate of pay. In some cases, they offered very specific values. "We recommend that an individual spraying artificial fertilizer on the pile of manure should complete 1.62 m^3/hour. This would increase the output norm currently stipulated by one cubic meter over the course of an eight-hour day." In other cases, they made a more general plea for a fairer pay scale. "We wish to make it clear that setting up a bed [for mushrooms] is one of the most difficult tasks … it demands much greater effort and skill than turning manure. Therefore, we request that this fact be taken into consideration when the piece rate is determined."[26] Workers knew full well what their work demanded, so they expected piece rates to reflect that fact. After all, the Communist Party had promised to make wage policy transparent.

The major thrust of socialist economic policy in the early years of Communist Party rule was to increase productivity and do so quickly. Every effort was made to pressure workers to step up the pace, which, as these examples show, was strongly resisted by the labor force. New norms were honored more in the breach than in observance. In many instances workers negotiated the pay rate for tasks assigned before they began the workday. Competitions to exceed production targets mounted at factories and farms often only existed on paper (Lampland 2016: 201–2). Frequent shortages of materials forcing work stoppages stymied government goals, as did the vagaries of weather impeding work carried out in the open. Party/state officials could do little to solve these problems in the short run, but in the case of accidental mishaps or dilapidated machinery, workers were held to account. Vicious accusations of sabotage branded scores of workers—agricultural and industrial—as enemies of the state, who were then swiftly punished and often imprisoned. Suffice it to say, greater energy was exerted to prompt workers to work than was ever invested in designing scientific wage schemes to boost production. This is mere speculation on my part, however, since party officials and government bureaucrats were never subjected to carefully monitored time and motion studies to ascertain the productivity of their labor.

Engineering the human motor to work at higher speeds required exacting methods for modifying behavior. The straightforward design of the method—its well-developed template in the United States—was easy to replicate, adding to its attraction. Missing from this account is any recognition of the need to define terms at the outset, to delineate the conceptual principles of the method. In Hungary the conceptual phase of formalizing—the beginning of the beginning—is found in the Central European notion of labor as labor power: effort over time. The analytic strategy to fit this conception would be to design a method to measure work that would incorporate not only a description of the task and define its temporal duration but would include an additional metric assessing the effort expended in completing the task. The formal depiction of these elements of work would be represented in a table, with columns devoted to a task's narrative description; its frequency (i.e., whether a singular event or repeated consecutively in the course of the task); the length of time required to perform the task given; a column describing the effort

[26]MOL XIX-K-1-j, 2 d., 8140/72/6.

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Table 1. This table represents the disarticulation of the task of drawing 1.000 kcm of blood from a pig by one person, and the accompanying measurements. The original document also contained a sketch of the specific movements described in the table. The table was compiled by employees of Phylaxia, the State Vaccine Development Institute and submitted to the Department of Labor Affairs of the Ministry of Agriculture. Dated 27 March 1950. Magyar Országos Levéltár XIX-K-1-j 3 d., 8140/18, pp. 3–4.

Components of an Operation	Frequency	Time	Exertion Factor	Norm/Unit (in minutes)
1. Cut bristles off the rump and the tail with a scissors	1/1	1.13	1.10	1.243
2. Wash the pig's rump and tail	1/1	0.39	1.10	0.429
3. Cut off the pig's tail	1/1	0.05	1.05	0.053
4. Place the cup for drawing blood on the rump	1/1	0.33	1.15	0.380
5. Take blood	1/1	12.36	1.25	15.450
6. Take the cup off the rump and close the vacuum	1/1	0.20	1.10	0.220
7. Take the cup to the table designated for the blood and return	1/1	0.31	1.15	0.358
8. Pull the pig to the door and let it out	1/1	0.33	1.20	0.396
				18.529
	6 percent of time wasted			1.112
				19.641
Since the worker taking blood is also the one tying the pig up, the time doing that is also added (minutes)				2.347
Drawing 1.000 kcm. of blood by one person (minutes)				21.988

expended, represented by a proxy metric; and a final one calculating frequency, time, and effort into a temporal unit constituting the norm assessed for the task (see Table 1). So, as we see, formalizing practices configure the features of a phenomenon in a concise and often novel representation to serve the purposes for which it was designed: a chart to depict trends in statistical data, a graph to display the shifting relations between two variables, a scientific model to test causal arguments, a metric to assess the dimensions of an object or event. In every instance, the initial conditions under which a formalizing practice has been conceived—social, cultural, historical, political—make a difference. The meanings of these differences may be ascertained by examining under what conditions and for what purpose a specific formalizing practice has been devised. Adopting a more explicit analysis of formalizing practices makes all this work visible.

Investigating the particularities of formalizing practices also raises important questions about social theory. Work scientists adjusted time and motion studies to fit local understandings of work: the productivity of labor measured as output/time versus labor power as energy expenditure/time + output. One might consider the oversight a common story of the neglect of cultural understandings when adopting a technology from elsewhere, but more is at issue here. Labor, and the companion notion of productivity, have long been treated as analytic concepts in the social sciences, and as such, as categories to be applied transnationally. It is no secret that the conceptual repertoire of social theory has been derived from European social history,

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an idea made pointedly in Chakrabarty's indictment of European provincialism (2000). What has escaped attention, though, is that the conceptual imaginary of Europe is itself divided, as the social histories of different regions diverge within the Continent. Some might balk at this suggestion. I argue nonetheless that this diversity of thought does not constitute an impediment to further theoretical generalization. Quite the contrary. It was precisely Marx's particular cultural understanding of labor power—a very different notion than British conceptions of labor—that made it possible for him to analyze British capitalism so effectively. In other words, diverse cultural concepts are an aid to theoretical debate, not a hindrance. Recognizing that formalizing practices are indexical sharpens our analytic acumen. It behooves us, therefore, to be far more attentive to the contextual import of ideas and terms that inhabit formal representations. Otherwise, we miss the point of the story.

Conclusion

I have made a bold claim: abstraction is an illusion. I have no objections to abstraction as an analytic technique per se, only to the common assumption that formalized representations doing the "abstracting"—such as graphs, charts, formulae, quantitative data—leave all traces of their initial conceptualization behind. The conditions under which formalized data are produced constrain their efficacy, though their limitations are not necessarily evident. I offer evidence of these constraints by comparing the design of time and motion studies in the United States and Hungary, formalized practices whose general features appear similar but in fact differ substantially due to divergent conceptualizations of the value of labor. In the United States, the value of labor is defined in terms of output, while in Hungary, the value of labor is expressed by the energy expended while working. Only by chronicling the design of time and motion studies in Hungary was it possible to discover this stark difference.

Past studies of formalizing practices tend to suffer from two mistaken assumptions. The first is the technicist fantasy that social problems can be solved by designing ever more complex technical systems that can juggle variables and sort data.[27] The constant hype about big data or the most recent fad being taught in business schools betrays a lack of confidence in our ability to understand the dynamics of social life unaided by smart devices. Clearly well-designed tools for analyzing masses of data to establish regularities or reveal patterns are essential in this respect. But the conceptual work lies in formulating the question. Playing around with a variety of scenarios—deploying different iterations of the model or method—opens up previously unimagined avenues to explore. These avenues may lead to exciting discoveries, yet we must not forget that they lead *from* somewhere. And somewheres, after all, have politics. Limited resources, clashing interests, glaring inequities pose ethical dilemmas that must be addressed, not relegated to a machine.

The second misconception is that theoretical terms in scholarly debates are in fact commensurate across the globe. We have taken for granted that the meaning of terms in political economy like labor or capital are understood to refer to the same

[27]By no means am I claiming to make a novel argument here. Decades of scholarship has addressed the confusion that arises from believing that social problems demonstrate a failure of technical expertise. Unfortunately, like the myth of the hydra, decapitating one strain of argument merely gives way to new versions appearing elsewhere (for a short list, see Clarke and Fujimura 1992; MacKenzie 1990; and Winner 1980).

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phenomenon wherever they are deployed. This is a mistake. A number of excellent studies in the history of economics (Babb 2001; Fourcade 2009; Mitchell 2002) have demonstrated, for example, that the nature of scholarship, the character of the profession, and the socio-political conditions defining the field have varied country to country; after all, the historical contingencies of modern state formation and the rise of academic institutions have progressed along distinct trajectories. Some may resist this theoretical diversity as a loss of analytic clarity. I argue, on the contrary, that recognizing our theoretical repertoire has greater variety and nuance means we may pursue a wider range of conceptual puzzles, leading to a richer understanding of social process.

I often quip: society is a verb. I have coined this trite oxymoron to emphasize the significance of actions and events, the transitory and ephemeral character of social process that nonetheless has powerful cumulative effects. I became keenly aware of the passage of time doing field work, especially when I was bored: hours and hours spent watching dull tv shows, listening to canned speeches by the evil party secretary, and waiting for hours on a cold November day for someone to finally deliver crates so we could start harvesting apples. None of this time was wasted, however, precisely because I learned that social process is time-bound.[28] A banal comment, no doubt, but the observation must be made because of the enormous pressures in the current academic climate to adopt truncated analytic techniques to speed up empirical work.[29] A tolerance for the quotidian is required to study formalizing practices too. Ideally, one would spend days and weeks observing and conversing with those engaged in the work, to follow the ups and downs and ins and outs of the deliberations involved in creating a formal instrument. Unfortunately, very few of us have the luxury of conducting this kind of research; the lack of funding and the constraints imposed by teaching schedules have made this kind of sustained field work very difficult to pursue.[30] That does not mean, however, that we should forget the fundamental principle that complex social configurations must be made over time. Enormous effort is expended in designing models and methods for growing business and improving social policy. My hope would be that we honor that work by paying more attention to it.

One final point. To say that formalizing practices are indexical points our attention to the doing of representation, to the pragmatic tasks involved in producing powerful tools for analysis. Knowing this, being aware of the indexicality of formalizing practices, makes it possible for us to subject our initial assumptions and basic beliefs to greater scrutiny, to lay bare their limitations and oversights. This way we can actively engage in the honest appraisal of the knowledge we produce and the epistemic infrastructures we create. What this also means is that we are reminded that where something happens, and when, is significant, not some colorful but

[28]Along the way, I learned a lot about how people consumed socialist entertainment, tolerated party propaganda, and cursed the inefficiencies of cooperative farm management (see Lampland 1995).

[29]I am thinking here in particular of those who advocate counting words in a text as a substitute for reading a document.

[30]Due to the generous funding made available to those of us who conducted research behind the Iron Curtain before the fall of the Berlin Wall, I was able to spend two and a half years doing participant observation for my dissertation. Archival work is less constrained, perhaps, because of the vast amount of material now available in digital form. One does not have to have been there when it all happened, but the documents still have to be read.

irrelevant background story. No matter how complex scientific wage schemes or algorithmic systems may be, particular people in specific situations bear responsibility—in varying degrees—for the product that issues from their collaboration. By tracing formalizing practices, we may engage more actively in the design process, forestalling and perhaps preventing harms that have been tolerated in the past. We may also have a better chance of calling people to account for their actions. And that is all to the good.

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References

Babb, Sarah. 2001. *Managing Mexico: Economists from Nationalism to Neoliberalism*. Princeton: Princeton University Press.

Bar-Hillel, Yehoshua. 1954. Indexical Expressions. *Mind* 63, 251: 359–79.

Barnes, Ralph. 1949[1937]. *Motion and Time Study*. New York: John Wiley & Sons.

Bates, Jo, Yu-Wei Lin, and Paula Goodale. 2016. Data Journeys: Capturing the Socio-Material Constitution of Data Objects and Flows. *Big Data and Society* (July–Dec.): 1–2.

Beer, David. 2017. The Social Power of Algorithms. *Information, Communication and Society* 20, 1:1–13.

Benjamin, Ruha. 2019. *Race after Technology: Abolitionist Tools for the New Jim Code*. Cambridge: Polity.

Biernacki, Richard. 1995. *The Fabrication of Labor: Germany and Britain, 1640–1914*. Berkeley: University of California Press.

Boumans, Marcel. 1999. Built-in Justification. In M. S. Morgan and M. Morrison, eds., *Models as Mediators: Perspectives on Natural and Social Science*. Cambridge: Cambridge University Press, 66–96.

Bowker, Geoffrey C. 2000. Biodiversity Datadiversity. *Social Studies of Science* 30, 5: 643–83.

Brenner, Robert. 1976. Agrarian Class Structure and Economic Development in Pre-industrial Europe. *Past and Present* 70: 30–75.

Breslau, Daniel. 1998. *In Search of the Unequivocal: The Political Economy of Measurement in U.S. Labor Market Policy*. Westport: Praeger.

Burks, Arthur W. 1949. Icon, Index, and Symbol. *Philosophy and Phenomenological Research* 49, 4: 673–89.

Campbell, Joan. 1989. *Joy in Work, German Work: The National Debate, 1800–1945*. Princeton: Princeton University Press.

Chakrabarty, Dipesh. 2000. *Provincializing Europe: Postcolonial Thought and Historical Difference*. Princeton: Princeton University Press.

Chun, Wendy. 2018. On Patterns and Proxies, or the Perils of Reconstructing the Unknown. e-flux, architecture. On Patterns and Proxies - Architecture - e-flux.

Clarke, Adele and Joan Fujimura. 1992. *The Right Tools for the Job: At Work in Twentieth-Century Life Sciences*. Princeton: Princeton University Press.

Collins, Harry and Robert Evans. 2009. *Rethinking Expertise*. Chicago: University of Chicago Press.

DiMaggio, Paul J. and Walter Powell. 1991. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organizational Fields. In W. Powell and P. J. DiMaggio, eds., *The New Institutionalism in Organizational Analysis*. Chicago: University of Chicago Press, 63–82.

Edwards, Paul N. 2010. *A Vast Machine: Computer Models, Climate Data, and the Politics of Global Warming*. Cambridge: MIT Press.

Erdélyi, Mihály. 1936. *A Pszichotechnika Alapkérdései* [The basic questions of psychotechnique]. Budapest: Királyi Magyar Egyetemi Nyomda.

Eubanks, Virginia. 2017. *Automating Inequality: How High-Tech Tools Profile, Police, and Punish the Poor*. New York: St. Martin's Press.

Fourcade, Marion. 2009. *Economists and Societies: Discipline and Profession in the United States, Britain, and France. 1890s–1990s*. Princeton: Princeton University Press.

Friss, István. 1950. "Introducing *Wages and Norms.*" *Bér és Norma* 1: 1–2.

Gainty, Caitjan. 2012. "Going After the High-Brows": Frank Gilbreth and the Surgical Subject, 1912–1917. *Representations* 118, 1: 1–27.

Gárdonyi, Sándor. 1933. Az Energiaeloszlás Elméletének Alaptételei és Grafikai Ábrázolása Vállalatok Szervezésénél [The basic theorem and graphical representation of the theory of energy dispersion in the organization of enterprises]. *Mezőgazdasági Üzem és Számtartás* 5, 2: 1–3.

Gebru, Timnit et al. 2018. Datasheets for Datasets. *In* arXiv.org, at [1803.09010] Datasheets for Datasets (arxiv.org).

Gilbreth, Frank and Lillian Gilbreth. 1916. *Fatigue Study: The Elimination of Humanity's Greatest Unnecessary Waste*. New York: Sturgis & Walton.

Gilbreth, Frank B. and L. M. Gilbreth. 1917. *Applied Motion Study: A Collection of Papers on the Efficient Method to Industrial Preparedness*. New York: Sturgis & Walton.

Hanks, William F. 2000. Indexicality. *Journal of Linguistic Anthropology* 9, 1–2: 124–26.

Hatvani, István. 1935. *A Pszichotechnika Szerepe és Jelentősége a Munka Racionalizálásában* [The role and significance of psychotechnique in the rationalization of work]. Győr: Baross-nyomda.

Hegedüs, Ede. 1947. A Munkabérrendszerről [On the wage system]. *Gazdaság* II :36–40.

Henke, Chris. 2000. Making a Place for Science: The Field Trial. *Social Studies of Science* 30: 482–512.

Kautz, Gyula. 1877. Néhány Irodalomtörténeti Adat a Hazai Telepítés Kérdéséhez [Some literary historical data concerning the question of domestic settlement]. *Nemzetgazdasági Szemle* I (Jan.–Mar.): 30–40.

Kenessey, Kálmán. 1868. *Mezőgazdasági Munkaerő-Calamitás* [Calamity of agricultural labor power]. Pest: Ráth Mór.

Knuuttila, Tarja and Andrea Loettgers. 2016. Model Templates within and between Disciplines: From Magnets to Gases—and Socio-economic Systems. *European Journal for Philosophy of Science* 6, 3: 377–400.

Lampland, Martha. 1995. *The Object of Labor*. Chicago: University of Chicago Press.

Lampland, Martha. 2010. False Numbers as Formalizing Practices. *Social Studies of Science* 40, 3: 377–404.

Lampland, Martha. 2016. *The Value of Labor: The Science of Commodification in Hungary, 1920–1956*. Chicago: University of Chicago Press.

Lampland, Martha. 2019. "From Each According to Their Ability, to Each According Their Need": Calorie Money and Technical Norms in Mid-20th c. Hungary. In T. Düppe and I. Boldyrev, eds., "*Economic Knowledge in Socialism, 1945–1989.*" Special issue of *History of Political Economy* 51, S1: 7–29.

Latour, Bruno. 1987. *Science in Action*. Cambridge: Harvard University Press.

Leonelli, Sabina. 2009. On the Locality of Data and Claims about Phenomena. *Philosophy of Science* 76: 737–49.

Leonelli, Sabina. 2011. Packaging Small Facts for Re-Use: Databases in Model Organism Biology. In P. Howlett and M. Morgan, eds., *How Well Do Facts Travel? The Dissemination of Reliable Knowledge*. Cambridge: Cambridge University Press, 325–48.

Livingstone, David N. 2003. *Putting Science in Its Place: Geographies of Scientific Knowledge*. Chicago: University of Chicago Press.

Loukissas, Yanni A. 2019. *All Data Are Local: Thinking Critically in a Data-Driven Society*. Cambridge: MIT Press.

MacKenzie, Donald. 1990. *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*. Cambridge: MIT Press.

Mártonfi, Rudolf. 1949. *Munka- és Időelemzés: Teljesítménynormák Szakszerű Megállapítása* [Work and time studies: the technical determination of performance norms]. Budapest: Munkatudományi és Racionalizálási Intézet.

McClellan, David. 1977. *Karl Marx: Selected Writings*. Oxford: Oxford University Press.

Milles, Dietrich. 1995. Working Capacity and Calorie Consumption: The History of Rational Physical Economy. In H. Kamminga and A. Cunningham, eds., *The Science and Culture of Nutrition, 1840–1940*. Amsterdam: Rodopi, 75–96.

Mitchell, Timothy. 2002. *Rule of Experts: Egypt, Techno-Politics, Modernity*. Berkeley: University of California Press.
Mohler, G. O., M. B. Short, B. J. Brantingham, F. P. Schoenberg, and G. E. Tita. 2011. Self-Exciting Point Process Modeling of Crime. *Journal of the American Statistical Association* 106, 493: 100–8.
Morgan, Mary S. 2012. *The World in the Model: How Economists Work and Think*. Cambridge: Cambridge University Press.
Passi, Samir and Solon Barocas. 2019. Problem Formulation and Fairness. *Proceedings of the ACM Conference on Fairness, Accountability and Transparency*, 10 Jan., 29–31.
Pittaway, Mark. 2012. *The Workers State: Industrial Labor and the Making of Socialist Hungary, 1944–1958*. Pittsburgh: University of Pittsburgh Press.
Powell, Richard C. 2007. Geographies of Science: Histories, Localities, Practices, Futures. *Progress in Human Geography* 31, 3: 309–29.
Rabinbach, Anson. 1992. *The Human Motor: Energy, Fatigue, and the Origins of Modernity*. Berkeley: University of California Press.
Radin, Joanna. 2017. "Digital Natives": How Medical and Indigenous Histories Matter for Big Data. *Osiris* 32: 43–64.
Seaver, Nick. 2015. The Nice Thing about Context Is that Everyone Has It. *Media, Culture and Society* 37, 7: 1101–9.
Silverstein, Michael. 2003. Indexical Order and the Dialectics of Sociolinguistic Life. *Language & Communication* 23: 193–229.
Smith, Crosbie and Jon Agar. 1998. *Making Space for Science: Territorial Themes in the Shaping of Knowledge*. New York: St. Martin's Press.
Star, Susan Leigh and Martha Lampland. 2009. Reckoning with Standards. In M. Lampland and S. L. Star, eds., *Standards and Their Stories. How Quantifying, Classifying, and Formalizing Practices Shape Everyday Life*. Ithaca: Cornell University Press, 3–24.
Szakáll, Sándor. 1943. A Magas Hőmérsékleten Végzett Munka Hatása az Emberi Szervezetre [The impact of work conducted at high temperatures on the human constitution]. *Mezőgazdasági Munkatudomány*, May–June: 249–56.
Ujlaki Nagy, Árpád. 1943. A Mezőgazdasági Munka Mechanikai, Termodinamikai és Biologiai Egyenértéke [The mechanical, thermodynamic and biological exchange value of agricultural work]. *Mezőgazdasági Munkatudomány*, July–Aug.: 316–27.
Vertesi, Janet and Paul Dourish. 2011. The Value of Data: Considering the Context of Production in Data Economies. *CSCW*, 19–23 Mar.: 533–42.
Vörös, Antal. 1976. A Magyar Mezőgazdaság a Kapitalista Átalakulás Útján (1849–1890) [Hungarian agriculture on the road to capitalist transformation (1849–1890)]. In P. Gunst and T. Hoffmann, eds., A Magyar Mezőgazdaság a XIX–XX. Században (1849–1949) *[Hungarian agriculture in the 19th and 20th centuries (1849–1949)*]. Budapest: Corvina Kiadó, 11–152.
Weindling, Paul. 1995. The Role of International Organizations in Setting Nutritional Standards in the 1920s and 1930s. In H. Kamminga and A. Cunningham, eds., *The Science and Culture of Nutrition, 1840–1940*. Amsterdam: Rodopi, 319–32.
Winner, Langdon. 1980. Do Artifacts Have Politics? *Daedalus* 109,1: 121–36.

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