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The Automation of Compliance: Techno-Legal Regulation in the United States Trucking Industry

Levy, Karen Elinor Conway

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THE AUTOMATION OF COMPLIANCE:

TECHNO-LEGAL REGULATION IN THE UNITED STATES TRUCKING INDUSTRY

Karen E.C. Levy

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Advisor: Paul DiMaggio

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Abstract

Rules of all types are increasingly enforced by digital mechanisms. Technological enforcement regimes appeal to policymakers, in part, because machines can enforce rules more perfectly than humans do; human enforcement is "messier" due to the discretion, incentives, and biases of both enforcers and enforcees. Technological rule enforcement appears to *shrink the gap* between rule and practice by minimizing the human element and compelling compliance. But I posit that technological enforcement regimes *relocate and reshape*, rather than close, gaps between on-the-books rules and on-the-ground practices. *New* gaps between rules and practices open up as new sites of social contestation are created, new parties are brought into negotiation with one another, and the interests of existing stakeholders are resituated.

This dissertation explores these dynamics in the context of new regulations that would mandate that truck drivers' work time be electronically monitored—rather than recorded on easily falsified paper logs, as they have been for decades—to induce compliance with hours-of-service limitations. My analysis considers how legal rules and technical capacities interact to create surveillant regimes that transcend public/private distinctions, realign institutional interests, and challenge occupational identities. I consider how communities of interest—law enforcement, trucking firms, and truckers themselves—respond to digital monitoring "in the wild." I find that interaction with these systems constructs new spaces between regulatory intention and social practice, provides new tools for managerial and legal control, and reconfigures industrial and law enforcement relationships.

The case offers an instructive context in which to investigate the interplay of social organization, legal rules, and technical capabilities. This research helps us conceptualize how

enforcement and regulation may be reframed when technological solutions are relied upon to exact compliance with rules. As technological enforcement mechanisms come to pervade many experiences of daily life, it becomes imperative to examine how these regimes emerge and interact with the social world. Through an in-depth examination of the development and operation of an electronic monitoring device in one legal and organizational context, this dissertation aims to contribute to broad social debates about the role of technological surveillance in legal rulemaking and social life.

Acknowledgments

I never would have imagined that I'd be spending my graduate career hanging around with truck drivers, but life sometimes takes unexpected turns. I've been incredibly, undeservedly lucky to have benefitted from the support of many people along the way.

I truly couldn't imagine a better graduate experience than I've had in Princeton's Sociology Department. Paul DiMaggio's advice, wisdom, and friendship have been indispensable. As my advisor, Paul taught me that asking the right questions is infinitely more valuable than answering the wrong ones, and showed me how to think precisely in order to ensure that my work was both rigorous and meaningful. What's more, as a wholly unanticipated bonus, Paul clued me into the canon of classic trucker songs, and my playlists are the better for it. If I can be half the mentor to my students that Paul has been to me, they'll be fortunate.

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Janet Vertesi opened my eyes to the wide world of academics studying technology who don't call themselves sociologists, and to the scholars working outside academia too. She gave me the idea, and the confidence, to try to spend the summer at Intel Labs, where this project was

born. Janet continues to dispense fantastic, sensitive advice about scholarship and career, which I plan to draw on for a long time to come.

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Helen Nissenbaum and danah boyd have opened doors for me that I never expected to get to walk through. Kevin Collins first spurred my interest in surveillance back in 2005 when he showed me a diagram of the panopticon; he continues to be a valued mentor nine years later. Gary Marx, Mary Madden, and Jannis Kallinikos offered detailed feedback that greatly improved the work.

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Freedom, and Privacy Conference; and the Privacy Law Scholars Conference. Finally, I've enjoyed the opportunity to disseminate the work publicly in *The Atlantic*, the *Los Angeles Times*, *mobilecollectives*, and on SiriusXM's Road Dog Trucking Radio.

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Chapter 1. Perfecting Regulation Through Technology

> *Ours is a progressively technical civilization … It is a civilization committed to the quest for continually improved means to carelessly examined ends.*
>
> *— Robert Merton (1964)*

"Technology is the empowerment of more truth, and fewer things taken on faith." Described in these terms—here by David Friedberg, the CEO of Climate Corporation (Hardy 2014)—technology is heralded as a panacea for social ills. Using technology, we can ascertain what people really do, instead of what they say they do; we can catch and deter cheaters and liars; we can generate knowledge where before we had only hunches and secrets; we can make people follow the rules.

On the basis of this logic, legal rules have come to rely more frequently on enforcement aided by technological artifacts. Policymakers are greeting technology with open arms, treating it as a tool to transform society into a more consistent and just version of itself, as technological enforcement helps us to achieve a 'more perfect' regulation (Mulligan 2008; Winner 1980).

Traditionally, legal enforcement is shot through with human discretion and autonomy. But increasingly—as digital technologies become more readily embedded in infrastructure, and as lightweight mobile computing and wireless connectivity facilitate the creation of new, digital sites of accountability—the potential violation of a rule may be effectively overridden by technological regimes of compliance. Rules of all types are increasingly enforced by digital mechanisms—from red-light cameras at intersections, to sensors that monitor employees' activities, to apps that let parents keep track of children's whereabouts. These tools are appealing

because they appear to enforce rules more consistently and objectively than human-dependent enforcement can.

At first blush, then, technological rule enforcement regimes appear to *close gaps* between on-the-books rules and on-the-ground practices, by removing (or at least minimizing) human elements and compelling the compliance of the regulated. However, this dissertation suggests that such an assessment is misguided. Instead, technological enforcement of a rule *relocates and reshapes*, rather than closes, gaps between edict and enforcement. It does so by creating new sites of contestation around rules and technologies, reconfiguring day-to-day interactions within social groups, and forging new networks in which power is negotiated.

In this dissertation, I examine the social dynamics of digital enforcement in depth, through an emergent site of techno-legal regulation: the use of electronic systems to monitor truck drivers' work time. The trucking case is a revealing site at which legal, technical, and organizational forms of regulation are rapidly co-evolving as compliance functions are dislocated from human beings to technical artifacts.

My empirical examination brings into dialogue concepts from legal studies, sociology of technology, and organizational studies, in order to address core issues around power, deviance, surveillance, and social control in the digital age. The dissertation aims to reframe our understanding of regulation for the era of ubiquitous computing, and to contribute to interdisciplinary debates about the role of digital enforcement in social life.

In this chapter, I describe the emergence of digital enforcement strategies across domains, and address the rhetoric of gap closure that often motivates their adoption. I discuss key theoretical concepts and empirical research in the sociology of technology, law, and organizations that help us to understand and evaluate digital enforcement in action. Then, I

address why digital enforcement is particularly salient in the context of roads and driving. The chapter closes with a discussion of trucking as a strategic research site, and a roadmap for the remainder of the dissertation.

Regulation, automation, and enforcement

Digital enforcement regimes delegate previously human enforcement functions to algorithms and machines (Akrich 1992; Latour 1992). For regulators,[1] the potential benefits to such uses of technology for rule enforcement are clear and frequently compelling. Technological enforcement regimes may be less resource-intensive; they may encounter less resistance from regulated audiences (Cheng 2006; Etzioni 1972); they may be more consistent and less amenable to arbitrary or discriminatory enforcement (Mulligan 2008); they may preempt rule violation *before* it occurs, rather than impose punishments only afterward (Seo 2013; Zittrain 2008). Much of the most influential work on the theory and practice of technological enforcement is, unsurprisingly, rooted in information technology policy (Lessig 2006; Nissenbaum 2001; Radin 2004; Tien 2004; Zittrain 2008) —but automation increasingly arises in other regulatory and adjudicative contexts, including social service benefits determinations (Citron 2008; Eubanks 2013), the use of risk-management software by financial firms (Bamberger 2010), prevention of re-offense in probation programs (Voas 2010), and commonplace rules that routinize everyday life, like traffic laws (McCartt and Eichelberger 2011).[2] But digital enforcement is also finding

[1] I define the term "regulator" broadly here, to encompass any party making and enforcing a rule in order to control the behavior of others. The term is not meant to refer specifically to only formal legal regulation by state agencies (though this form of regulation is, in fact, central in the truckers' case).

[2] As noted by Rosenthal (2011), technological compliance regimes are theoretically related to situational crime prevention strategies (Katyal 2002; Newman 1973) and "libertarian

increasing traction in diverse non-state contexts (like workplaces and families) and across scales (Levy 2013).

The digital enforcement paradigm owes a debt to the rise of "big data"-driven policymaking, including new regulatory models that rely on fine-grained data collection to drive individual behavior. In light of lightweight mobile computing and cheap information analytics, it is unsurprising that behavioral monitoring is becoming a popular governance strategy. The proliferation of these tools could amount to a paradigmatic shift in how social control happens by "embedding governance" into material and digital artifacts (Institute for the Future 2009). Technological artifacts are more durable and consistent than error-prone, arbitrary humans are; as Latour (1992) suggests, it is easier to talk a human police officer out of a ticket than to negotiate with a speed bump.

We have only begun to explore the social implications of these types of enforcement mechanisms. We know that reliance on technological enforcement can raise serious concerns about the security of private information (Bamberger and Mulligan 2008), and that it can make salient new forms of resistance while devaluing others (Dupont 2008). We know that adjudicators can be prone to "automation bias," the tendency to trust entirely the outcomes produced by technological systems (Citron 2008), which appear to create objective accounts of human action, and to mete out liability without individualized bias. Radin (2004) suggests that technological restrictions can effectively decouple ownership of property and control of that property, while Kerr (2010) contends that they disable possibilities for productive moral deliberation over the boundaries of individual rights. Efforts to enforce rules technologically can reconfigure social relationships, particularly when they rely on behavioral monitoring. Their

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paternalism"-based policymaking (Thaler and Sunstein 2008), in that these strategies also aim to influence the behavior of a regulated party structurally (see also Cheng (2006) on regulation via fiat vs. structure).

emergence poses questions around contextual privacy expectations (Nissenbaum 2009) and the roles of trust and authority in relationships.

Rhetoric of digital enforcement as gap closer

Despite the broad variety of technologies used for enforcement, the rhetoric that tends to accompany such efforts is remarkably consistent. Digital rule enforcement is habitually lauded for *closing the gap between rule and practice* by removing (or minimizing) the human element and compelling compliance, often by overriding a party's decision to violate a rule. Making decisions algorithmically or tracking behavior digitally appears to wash these processes of bias and fallibility, as the ostensible dispassion of the computer substitutes for human uncontrollability. Consider, for instance, a new NYPD program in which traffic citations are electronically scanned four times at various stages, in response to a widespread ticket-fixing scandal in which officers "took care of" tickets for friends and family by throwing copies of the citations away. "Once [a ticket] gets into the system, it would be very hard to … get rid of it," Mayor Michael Bloomberg said, "because it's just—it's too easy to track" (Baker and Goldstein 2011).

The rhetoric of technological gap closure borrows strength from three conceptual cousins—technological determinism, technological solutionism, and technological utopianism. *Technological determinism* (Scranton 1995; Smith and Marx 1994) holds that technology dictates social processes via its own causal authority; determinists downplay the impact of social factors on shaping technologies themselves. *Technological solutionism* is identified by Morozov (2013) as the tendency to seek panacean technological 'fixes' for complex social and

institutional problems. And *technological utopianism* (Kelly 2010), with ties to both Marxist predictions of revolution and 1960s countercultural ideology (Barbrook and Cameron 1996; Turner 2006) is the tendency to equate the proliferation of technology with a dramatic improvement of living standards. Backed by this constellation of ideas and ideals, gap closure finds substantial popular support, justifying deployment of digital enforcement regimes.

Yet sociological examination reveals substantial complications of the gap closure rhetoric in empirical practice. Are rule/practice gaps actually closed by digital enforcement? What social values and negotiations occur in the interstices between rules and practices that might serve as countervailing forces against gap closure? Previous research in the sociology of law, technology, and organizations informs our analysis.

Gap closure vs. gap relocation

I posit that digital enforcement regimes *relocate and reshape*, rather than close, gaps between on-the-books rules and on-the-ground practices. When machines are used to enforce policies, *new* gaps open up—as new sites of contestation are created, new parties are brought into negotiation with one another, and stakeholders' interests are resituated. As sociologists of technology have well established, technical systems are shot through with social influence (Pinch and Bijker 1984, Winner 1980). Discretion and bias enter technological artifacts at all stages, from design to use to reappropriation; governed parties are not passive receptors to mechanisms of control, but actively participate in constructing new meanings and uses of a sociotechnical system, creating new incongruities between regulatory intention and real practice. The gap between on-the-books rules and on-the-ground practices has long been a core focus of inquiry in

legal studies and in the sociology of organizations.[3] Next, I briefly describe the contributions these fields have made to our thinking about gaps, which greatly inform my study here.

There is plenty of social utility and negotiation to be found in the gaps created by imperfect enforcement, in interpersonal, organizational, and legal contexts. These merits can be loosely categorized as *fiction*—the creation of false accounts—and *friction*—which creates space for ambiguity and situational noncompliance.[4]

Fiction: the values of falsehood

In some cases, falsehood can be socially productive. If digital data-gathering eliminates this possibility, it may also eliminate possibilities for growth, innovation, and the smoothing of social relations. It is easy to imagine social situations in which lying serves positive social ends for one party or another, perhaps by giving them the means to deviate from or otherwise negotiate role expectations. A teenager who lies to his parents about where he's going in his car is testing boundaries and achieving a measure of freedom, in preparation for adulthood; if his parents track his car via GPS (through one of many sensor systems on the market) in order to

[3] "Gap studies," in name, became a focus of inquiry in the 1960s, with the advent of the field of sociolegal studies (Gould and Barclay 2012; Sarat 1985). This field, an intellectual descendant of the legal realist movement, brought attention to the gulf between on-the-books and on-the-ground law: the multitude of social factors that make real social practices around legal rules and institutions diverge from statutory prescription. Sociolegal gap studies became less popular in subsequent years, in large part due to criticism of one of its assumptions—namely, that law has rational goals and objectives that can be articulated, interpreted, and measured against (Gould and Barclay 2012)—and the failure of much gap-oriented research to interrogate the motives and power arrangements underlying law-as-written. My focus in this study, then, is not merely to illustrate the presence of a gap, nor to rely upon the problematic assumptions of early gap studies. Instead, I take as given that social practices around law are constitutive of law itself; there is no "pure" or "core" law without social context. I use the rule/practice gap as a rhetorical device to characterize the discourse around technologically-driven enforcement regimes, and consider how social practices change when such strategies are used.

[4] I am indebted to danah boyd for her help in formulating this pairing.

enforce his curfew, this possibility for growth is obviated. A woman lying to her abusive partner about her whereabouts may be doing so for personal protection, lost if he tracks her via her mobile phone (using, for instance, a Find My Friends app). The lack of a complete, thorough record of our activities is essential for social functioning; in some cases, it can be beneficial to forget (Mayer-Schonberger, 2009, refers to such a permanent record as a "temporal panopticon").

Organizational fictions. Falsehood can be an important element of organizational relations, too, serving strategic social functions for one or more sets of actors. What organizations say they do is not always what they actually do; rules on the books are not always reflected in practices on the ground. In response to pressures for institutional conformity, organizations may decouple legitimacy-bestowing formal (or "ceremonial") rules from efficiency-supporting informal practices (Meyer and Rowan 1977; Oliver 1991; Sauder and Espeland 2009). Gouldner's (1954) seminal work on "mock bureaucracy" describes rules in place in a gypsum mine that are in neither managers' nor workers' immediate interests to enforce. These rules are enforced only on rare occasion (e.g., a smoking ban is enforced only when insurance inspectors are present), while most of the time managers "looked the other way." In so doing, these rules fulfilled a "leeway" function, providing supervisors with a bargaining chip they used to maintain informal relationships with workers.

More recently, Anteby's work (2008) on "moral gray zones" in industrial production—in which managers and employees together engage in practices that are officially proscribed, yet unofficially tolerated and even encouraged—describes how such practices can support the occupational identity of employees, while granting managers fine-grained control over employee conduct. The gap on which Anteby focuses consists of the making of "homers," small artifacts

created by employees using company time and materials, often presented as gifts to new retirees. Anteby suggests that tolerance of homer-making gave managers the opportunity to grant differential leeway to individual employees in ways that they could not have using other mechanisms (e.g., wages, which were strictly determined by a collective bargaining agreement): "Such arrangements around homers offered venues for more nuanced regulation than corporate, company-wide policies might ever allow. They provided management with influential ways to distinguish among their workers beyond what employment categories and coefficients would allow for[.] … Thus, by engaging in homer-making and accepting a reward in this matter, a worker entered into an implicit contract that conceded management significant additional control" (p. 130).

Perhaps the best evidence that organizations presuppose and rely on a gap between rule and practice is the "work-to-rule" labor action, in which unions exert pressure on management by following each rule in the book to the letter, slowing organizational functions to a halt (Davis 1999; Morrill, Zald, and Rao 2003). The fact that working-to-rule functions as a resistance tactic shows that most of the time, practices *do not* fully accord with the rules.

Legal fictions. In law, too, fictions[5] can create "wiggle room" for social negotiation (Calavita 2010). If laws were enforced letter-for-letter, social and economic life would come to a standstill; yet, even in cases of nonenforcement, laws can still serve important social functions. The clearest example here is purposive nonenforcement of law. Selective legal enforcement *can* be the basis of arbitrary or discriminatory treatment, to be sure, but it can also operate toward a

[5] Note that this is a somewhat different sense than the usual meaning of the term "legal fiction," which refers to a false fact that is assumed or stipulated to be true in order to apply certain legal rules to the situation. The archetypal legal fiction in American law is the idea that corporations are persons; though corporations are clearly not actually persons, specifying them as such enables us to apply other legal rules to their activities (e.g., according them the right to free speech).

number of less insidious ends. Outdated laws that fail to align with contemporary social conditions frequently fall into disuse; consider, for instance, Brooklyn's recent decision to stop prosecuting most marijuana possession offenses (Clifford and Goldstein 2014). Allowing such laws to fall quietly by the wayside via nonenforcement is a route around the reality that removing such laws from the books is often politically slow, contentious, and inefficient (Rodgers and Rodgers 1966).[6]

Nonenforcement can also occur when a law is *symbolic* in nature, and intended as a communicative signal rather than an enforceable proscription; for example, many colleges have set up anti-hate-speech codes they know to be constitutionally overbroad (and thus unenforceable), but which have their intended effects due to the political signals such enactments communicate in their communities (Gould 2001). In another variant, New York City declined to issue citations after passing a smoking ban across city parks and beaches, likely in reliance on the presumption that the ban would create new operant norms, such that citizens would enforce it upon each other without formal state involvement (Saul and Autry 2011).

In contracts (Macaulay 1963), in family law (Mnookin and Kornhauser 1979), and in interpersonal and community disputes (Engel 1984; Felstiner, Abel, and Sarat 1980; Merry 1979), legal obligations often go willfully unenforced. Rather than operating as steadfast if-then consequences of noncompliance, they create a backdrop of base expectations against which extralegal negotiations can occur. Nonenforcement, then, can also operate as a resource for the management of interpersonal and institutional relationships.

[6] The legal doctrine of desuetude can operate as a defense against long-unenforced laws; for instance, some legal scholars have suggested that prominent cases striking down laws about intimate behavior, such as the statutes at issue in *Griswold v. Connecticut* and *Lawrence v. Texas*, can be read through a desuetudinal lens (Sunstein 2003).

What would become of outdated laws, or symbolic obligations, or willful unenforcement in the interest of relationship management, should rule enforcement become automated? Of course, automation could preclude possibilities for discriminatory, arbitrary, and/or resource-intensive enforcement in some instances. But as these diverse situations illustrate, it would also short-circuit a number of other uses to which law is put; these interests are social obstacles against which a digital enforcement regime would have to contend when put into action.

Friction: accounting for exigency and social change

Enforcement gaps also provide for *social friction*: for the possibility that conflict will arise openly, or that certain situational exigencies will trump by-the-book enforcement. We may want a rule to be *generally* followed, but we also want to allow for noncompliance or disobedience in certain situations, which cannot always be delineated in advance (or programmed into code). Technological enforcement regimes that seek to automate compliance might reduce such friction.

Situational override. Situational exigencies often call for violating rules. The archetypal example is a sick person being rushed to the hospital to save her life; despite the fact that she may be violating posted speed limits, we can hardly begrudge the decision to do so, nor would many of us want to live in a world in which such violation were made impossible. It is easy to imagine other scenarios in which the violation of rules seems situationally justified, such as the prevention of certain harm (like swerving out of the way of a child in the road). Human beings are generally better equipped to make more nuanced judgments about the demands of a non-standard situation than are artifacts, though individuals' evaluations of such demands may differ

or, after the fact, be judged invalid.[7]

Disobedience and social change. There may be general social good in allowing rules to be disobeyed; enforcement gaps enable this friction. Conscious resistance to rule enforcement—in the form of whistleblowing, civil disobedience, or conscientious objection, for instance—may amount to effective protest, instigating social change. Processes that attend traditional enforcement, like legal adjudication, can be important elements in ensuring the legitimacy of a rule or rulemaking authority, which may be diluted if enforcement is overly routinized (Citron 2008).

To the extent that such rules become technologically enforced, they limit the opportunities for such disobedience. This can have a number of effects. It can decrease the opportunities for moral deliberation to the extent that it makes law black-boxed and invisible: if, for instance, African-Americans in the civil rights era were biometrically prevented from sitting at lunch counters, their opportunity for public protest might have been greatly diminished. Of course, it is not the case that technological systems are wholly unhackable or immune to circumvention, and conscientious resistance to a rule may still occur when enforcement is technologically embedded. It is generally more difficult for people to resist automatized systems, and such resistance may implicate different skillsets or motivation (e.g., technical know-how vs. political resolve); as such, technologically embedded enforcement may remove the possibility for socially productive deliberation that may result in formulation of "better" rules (Kerr 2010).

In addition, overspecification through technological enforcement can foreclose the possibility for "grey area" tinkering, in which people behave in unanticipated but socioculturally

[7] In addition to personal exigencies, individual disobedience can be desirable in the aggregate. When New York Mayor Bill DeBlasio proposed a zero-tolerance policy for jaywalking, economists were quick to point out that if anti-jaywalking rules were followed to the letter, the city would come to an economic standstill (Goodman and Flegenheimer 2014).

productive ways. In copyright, for example, the doctrine of "fair use" is an imprecise umbrella under which a tremendous amount of user-initiated innovation and cultural production has taken place. To the extent that copyright law is enforced through prophylactic technological compliance mechanisms rather than (necessarily more ambiguous) legal rules enforced *post facto*, these possibilities for innovation are foreclosed. As Gillespie (2007:61) describes: "[t]echnological systems, unlike laws, are designed to fully iterate every possible activity. … Within this system, there is no room left for ambiguously permissible behavior; every use is either allowed or refused, free or priced, at the moment it is attempted, with no exceptions" (see also Cohen 1998).

Noncompliance is not an unequivocal good, and digital rule enforcement may be politically justified. We may argue that automatic, technological enforcement systems are simply more effective policing mechanisms, and can be supported according to the same bases that warranted the underlying rule in the first place. If we would go to the trouble to establish the rule in the first place, this logic goes, why *wouldn't* we want an enforcement regime that effectively administers it? Compliance with the rule may be so important, or its violation so harmful, that effective deterrence and punishment are of paramount importance. But in other cases, the consistency technological enforcement enables is not socially desirable, especially given the potential path-dependence of algorithmic or technological decision-making; even when technologies adapt through machine learning, the goals they are intended to enforce can ossify. In some cases, techno-legal designs and algorithmic determination systems attempt to account for this by placing a "human in the loop" —a human entity that serves as a check on the goals and means of the system, perhaps through an appeals process.

To sum up: across a number of legal, organizational, and interpersonal contexts, gaps between rules and practices are important sites of social activity; their presence allows rules to fit around the contours of social life, provides a backdrop for negotiations around power relations, and enables long-term social change. The existence of these practices suggests that digital enforcement regimes that aim to close such gaps will confront the "actual order" (Molotch 2012) that exists within them.

The not-so-open road

In what contexts might we expect digital enforcement regimes to arise? We might postulate a number of preconditions that could make resort to such strategies more likely. For instance:

(1) The behavior being regulated is spatially diffuse.

(2) Rule violation occurs frequently.

(3) Rule violation can cause significant social harm.

(4) Human-dependent enforcement is highly resource-intensive, and/or relies on *post hoc* subjective reconstructions of events that are difficult to corroborate.

(5) Multiple institutional interests align in favor of digital enforcement strategies.

Given this (informal) set of preconditions,[8] it is unsurprising that vehicular activity on public roads has emerged as a nascent locus of technological control. A human being behind the

[8] Empirical assessment of preconditions for digital enforcement regimes would be a promising avenue for future research.

wheel of an automobile wields incredible power to jeopardize the lives of others; individuals are famously poor decision-makers when it comes to self-regulating their behavior on the road, or even accurately estimating the risks they take. Eighty-eight percent of drivers consider themselves safer than average, and often continue engaging in risky driving behaviors even after surviving a crash in which others died (Lee 2009). The public roads are accordingly sites of intensive and multi-layered regulation, and are the location in which most individuals encounter and engage with the law most directly (Seo 2013).

Much of this regulation has traditionally been imposed through traditional law—speed limits, traffic laws, licensure requirements, and the like. But despite these rules, people routinely violate the rules of the road—speeding, texting, driving while intoxicated—and human police officers can penalize only a tiny fraction of these behaviors (and then only after the fact, when damage may have already been caused), in large part because violators are mobile. Multiple stakeholders could benefit from more stringently enforced rules, including the motoring public, the state, and insurance interests.

Accordingly, a number of efforts to modulate drivers' behavior via technological solutions have taken hold.[9] Devices that track eye movements, monitor steering and braking behavior, and which provide immediate or long-term feedback to drivers show some promise for ameliorating unsafe driver behaviors (Lee 2009). Such technologies may be effective by providing feedback upon which drivers can act to improve performance, or by creating barriers to unsafe action (for instance, by barring the driver's ability to make cell phone calls while a car is in motion (Pogue 2010)). But many of the mechanisms through which such technologies work

[9] Autonomous (self-driving) cars have generated much research interest and technical promise, though they face significant social and legal hurdles to adoption (Markoff 2012). In a recent Harris poll, 80% of respondents stated they were fearful of autonomous vehicles, citing concerns like technological glitches, hacking, and liability (Eisenstein 2014).

are explicitly social. The records they create may be viewable by parties other than the driver (parents, employers, insurers, etc.), and can have real consequences that motivate behavior change. As Ayres and Nalebuff (2003:84) put it, "[f]ear of getting caught may be a more powerful motivator than fear of getting killed." Such a technology can be performative, then, in that its very presence generates the desired effect. Consider the "Growler," a technology used to monitor ambulance drivers—

> If [the driver] accelerated too fast or took a corner too hard, the machine would squawk. If he didn't slow down, it would squawk louder and make a record of the transgression. When he got back to base, he'd have to explain the indicators. The Growler made him drive more safely. (Ayres and Nalebuff 2003:84)

Cumulatively, the proliferation of technologies meant to monitor and control road activity—from electronic data recorders to traffic cameras to EZ-Pass—can have an erosive effect on driver privacy, particularly when the data they gather is put to secondary uses. For instance, data gathered by systems like these may be used as evidence in divorce proceedings, as a justification for insurance rate hikes, or can be a basis for government surveillance or use by commercial marketers (McDonald and Cranor 2005).

Commercial trucking as a strategic research site

The public highway, then, is fast emerging as a site of intensive digital regulation. And perhaps no population is experiencing the ramifications of this development as acutely as are long-haul commercial truck drivers—who, by the nature of their labor, treat the highway as their workplace. As I describe in Chapter 4, the workplace is another locus in which digital

technologies are fast emerging for organizational control over employees' behaviors (Lohr 2014); trucking, then represents the intersection of these two sites.

This dissertation examines how truckers' labor and interactions are reconfigured by the proliferation of digital enforcement regimes to implement rules—both legal mandates and organizational directives. These regimes upend the occupational autonomy truckers have traditionally held, shift knowledge flows within trucking organizations, and alter the dynamics of microinteractions between truckers and human enforcers. In so doing, they confront both the fictions and frictions that characterize daily legal and organizational practices in trucking—the widespread use of "flexible" record-keeping routines, and the discretionary exercises necessitated by a highly contingent, unpredictable workplace—on which the economic realities of the industry rely.

In the next chapter, I describe the trucking industry and the technology upon which this study focuses in much greater detail. For the moment, however, I note that trucking constitutes a strategic research site for the investigation of digital enforcement more broadly. Merton (1987:10–11) defines such a site as one that "exhibits the phenomena to be explained or interpreted to such advantage and in such accessible form that it enables the fruitful investigation of previously stubborn problems and the discovery of new problems for further inquiry." I suggest that trucking acts as such a site vis-à-vis the emergence of the digital enforcement paradigm, for four reasons.

First, digital enforcement regimes in trucking represent the technological instantiation of both legal and organizational control systems. As I will describe, the technology upon which this study focuses—the *electronic on-board recorder*, or EOBR—is a legal creation, the product of federal regulations designed to compel drivers' compliance with other legal rules that limit the

amount of time truckers may drive each day. Yet the EOBR also plays a central role in compelling drivers' compliance with organizational directives, like maximizing fuel efficiency and minimizing out-of-route driving. And trucking firms are major stakeholders in the formulation of the legal rules around the technology as a timekeeper, since they too have (often complicated) interests in how much drivers may drive; within the trucking industry, these rules are politically controversial and tightly bound up with industrial organization. In addition, the EOBR is a cultural artifact, and its use (and non-use) is intimately connected to occupational norms about machismo, independence, and self-knowledge. The electronic monitoring debate in trucking, then, is explicitly a legal, organizational, and cultural controversy, marked not only by federal regulations but by a complex organizational landscape and strong cultural norms about occupational autonomy and control.

The complex confluence of legal rules, social organization, cultural norms, and technical capabilities that we find in trucking makes it a strategic site for examining the interplay of multiple domains in shaping technologies. Compare Gillespie's (2007:17) characterization of the "heterogenous square" of technological control in the case of anti-piracy copyright regimes as a mutually bolstering regulatory system of "technical artifact, commercial agreement, cultural justification, [and] legal authority." Gillespie clarifies that focusing only on the technical, without regard for the other forces of power and control that buttress (or undermine) technical systems, is likely to lead to an incomplete picture of how and why such regulation "works" (or doesn't). He emphasizes the need to analyze so-called "regimes of alignment" surrounding regulatory technologies, which he describes as the "prominent inclusion of technical elements into an aligned set of efforts, partnerships, and laws that together arrange people and activities into a coherent system… [through] the interlocking of the technological, the legal, the

institutional, and the discursive" (2007:99, 102). In a distinct but allied vein, Haggerty and Ericson (2000) suggest that the convergence of private and public, state and non-state component systems into integrated, overlapping, continuous regimes of surveillance—what they term the "surveillant assemblage"—constitutes a transformative feature of late modernity, which "provid[es] for exponential increases in the degree of surveillance capacity" (2000:610). Taken together, Gillespie and Haggerty/Ericson's assertions about the integrated nature of modern surveillance make trucking a strategic site for theoretical investigation, due to the overlapping nature of the private/public control regimes at play, and the multifaceted interplay of technology, culture, social organization, and law.

Second, truckers comprise quite a large population; there are roughly three-and-a-half million truckers working in the United States. A population this large—and upon whose invisible labor the economy so thoroughly depends—is worthy of study in its own right. But a population this large is also bound to contain a good deal of variation, which is methodologically useful for investigating the nuances of a phenomenon like digital enforcement. And indeed, while truckers are predominantly male and frequently come from rural backgrounds, there is significant internal variation in the population in terms of factors like age, industry experience, organizational and employment arrangements, and comfort with technology. In addition, because truckers are (by necessity) geographically distributed across the country, they constitute an accessible population for research. (I describe additional methodological considerations around truckers as research subjects in Chapter 3, with particular attention to their geographic mobility.)

Third, as I have noted (and discuss in greater detail in Chapter 2), trucking as an occupation is allied with strong cultural notions of independence, machismo, and defiance against strictures of control. The icon of the "asphalt cowboy" has been a dominant figure in

trucking for decades (Hamilton 2008); truckers who strain against authority in traditional employment settings may self-select into trucking as an occupation in which the day-to-day routines of work have, traditionally, been largely self-directed. In confrontation with electronic control regimes that deplete truckers' occupational autonomy, truckers' defiant streak often manifests itself via social and material strategies of resistance to the technological system.

Chapter 7 systematically examines truckers' varied resistance maneuvers, and makes the case that the time is ripe for scholarly attention to technological resistance practices: as monitoring continues to emerge as the dominant paradigm of institutional regulation (and as wholesale opt-out from intersecting surveillance systems becomes a less tenable strategy), we might expect regulated subjects to increasingly seek out creative strategies that challenge, obfuscate, and thwart data collection about them (Brunton and Nissenbaum 2011). I do not suggest that truckers constitute a representative group from which to generalize about resistance practices in the greater population. But because resistance in their occupational community is both ardent and widespread, attention to the varied practices truckers have developed to obstruct digital enforcement can help us to develop theoretical frameworks and typologies through which to examine the resistance phenomenon more generally.

Finally, trucking is a temporally strategic site for investigation of digital enforcement given the degree and rate of dissemination of digital enforcement mechanisms in the industry. As I describe in more detail in Chapter 2, EOBRs are not yet legally mandatory, but are already in widespread use for a variety of reasons. Though EOBRs are far from randomly distributed in the industry—their use is currently skewed toward trucks owned and/or managed by larger companies—this natural variation in the field allows me to see firsthand the social practices that attend analog vs. digital recordkeeping mechanisms. For instance, as I explore in Chapter 6, the

microinteractions between law enforcement officers and truckers differ categorically depending on whether these digital mechanisms are in use or not. I am able to analyze these differences by observing both analog and digital control mechanisms in the field at once. Moments of technological transition, in which the status quo is disrupted, can be particularly illuminating occasions for unearthing the entrenched assumptions and power arrangements that undergird social organization (Bailey, Leonardi, and Barley 2012; Barley 1986); thus, examination of the trucking industry at such a moment is temporally strategic.

Structure of the dissertation

This dissertation is composed of eight chapters, and proceeds as follows. Having set forth the idea of digital enforcement and its theoretical scaffolding in this chapter, in Chapter 2 I turn to the case at hand—the United States trucking industry. I describe the rules that govern truck drivers' work time, and the emergence of digital monitoring for enforcement of those rules. Then, I explain in detail the introduction of a digital enforcement regime into trucking, the *electronic on-board recorder (EOBR)*, and offer a sketch of its technological and regulatory histories. In addition, I describe the political economy and organization of the industry, and delve into the rich culture that accompanies the profession of truck driving. I discuss how the introduction of the EOBR is incompatible with the economic and cultural contexts of industry practice.

Chapter 3 provides notes on the methodological basis of the study: I describe the contours of the multi-sited ethnography in which I engaged, and explain some of the methodological

strategies I used in light of challenges that arose. I also offer some reflections on interactions between my personal identity and my communications with research participants.

Next, I examine how monitoring systems reshape information dynamics in trucking firms. Chapter 4 uses data from interviews with drivers, dispatchers, trainers, and fleet managers, as well as on-site ethnographic observation at four firms. Drawing from literature in organizational sociology, I find that fine-grained performance monitoring redistributes operational knowledge within companies. The systems accrue real-time aggregated data in remote dispatchers, removing much of truckers' traditional day-to-day decision-making autonomy by deemphasizing the importance of local and biophysical knowledge. Firms then strategically redistribute knowledge in drivers' communities (their coworkers and even their families) to incite drivers' compliance with organizational goals like fuel efficiency. This chapter demonstrates that information technologies may not only rationalize work, but can also provide a basis for management to reembed data in workers' social relationships in order to create new performance pressures. These dynamics suggest how new social alignments can emerge when digital enforcement regimes are in place.

In Chapter 5, I turn to the interface between truckers and law enforcement officers, and explore challenges created by hybridity between human and digital law enforcement. Human law enforcement officers' interactions with drivers change when enforcement efforts are augmented by machines. I find that the monitors destabilize traditional power dynamics in police interactions with truckers. Officers often have considerable difficulty acquiring data from the monitors, and these technical troubles are overtly visible to drivers, undermining their perceived authority. Drivers also exploit human law enforcement officers' reluctance to engage with technology by misleadingly signaling the presence of digital monitors in trucks, thus engaging in

'decoy compliance' that pits human and machine against one another. This chapter demonstrates how human discretion and the performance of authority remain fundamental to the enforcement regime, even when it relies on digital technology.

Chapter 6 considers issues of resistance, looking critically at practices drivers and others employ to "beat the system." Drivers employ varied resistance strategies, including physical tampering, data manipulation, and strategic organizational practices. Some strategies involve collusion among drivers and seemingly disinterested third parties, like gas stations. These maneuvers construct new gaps between regulatory intent and social practice, and can be understood as efforts to reassert traditional behavioral norms required by the economy and organization of the industry.

Chapter 7 considers the political discourse surrounding electronic monitoring, focusing on the use of alternative frames in regulatory rulemakings about the technology. With a collaborator, I conducted topic modeling analysis on a corpus of 3500 public comments submitted over twenty-five years of regulatory debate. This analysis reveals that organizational interests frame the EOBR issue very differently than do individual citizens: individuals framed the technological debate in terms of broader logistical problems facing the industry, while organizations were more likely to discuss the proposals more narrowly, in terms of cost/benefit quantification. The regulatory process is a site in which different interpretations of a technology, imputed by different groups of stakeholders, come into conflict; the regulations that result entrench and stabilize certain interpretations, and discount others.

Finally, in Chapter 8, I contexualize the truckers' case within the broader landscape of the digital enforcement paradigm. I return to the framing of gap closure, and discuss implications of the trucking case for understanding regulation in the age of ubiquitous computing.

Chapter 2. If the Wheel Ain't Turnin', You Ain't Earnin'

Since the 1930s, American long-haul truckers have been required by federal regulations to limit their work hours, in order to reduce accident risk caused by driver fatigue. Each year, truck crashes on America's highways kill 4,000 people and injure 100,000 more, at an annual cost of over $40 billion (Truck Safety Coalition 2011). Though several factors contribute to crash risk, driver fatigue has been identified as having the strongest effect on accident rates (Lin, Jovanis, and Yang 1993). One study (Braver et al. 1992) found that nearly three-quarters of all drivers admit to violating the hours-of-service regulations; in another survey (Belzer 2000), a third of truck drivers admitted to falling asleep at the wheel at least once in the previous month.

Though specific time limits have changed over the years, most drivers may legally drive no more than eleven hours per day, and can be on duty (a status which includes both driving and other functions, like fueling, loading/unloading, and performing requisite vehicle inspections) for no more than one fourteen-hour window per day. After the maximum on-duty time is reached, a ten-hour break is required. Weekly limits also apply: most truckers can work up to seventy hours in any eight consecutive days, and then must break for thirty-four hours ("reset your 70").[1] Drivers are required to keep a daily record of hours worked, typically via paper logbooks (Fig. 2.1), which can be checked by law enforcement at weigh stations and are periodically submitted to the driver's employer.

In order to facilitate enforcement of the hours-of-service regulations, *s*ince 1940, truck drivers have been required to keep daily paper logs in order to keep track of their hours of

[1] Current hours of service rules are listed in the Code of Federal Regulations, 49 C.F.R. § 395.3 (2007).

service; for the last thirty years, these records of duty status (or "RODS") have been kept using a standardized "graph grid" form.[2] Graph grid logbooks are a staple for truck drivers; a 31-day supply may be purchased at any truck stop for a couple of dollars. Logs must be kept up to date at all times, as they can be audited by law enforcement at weigh stations or at roadside, or may be submitted to an employer.

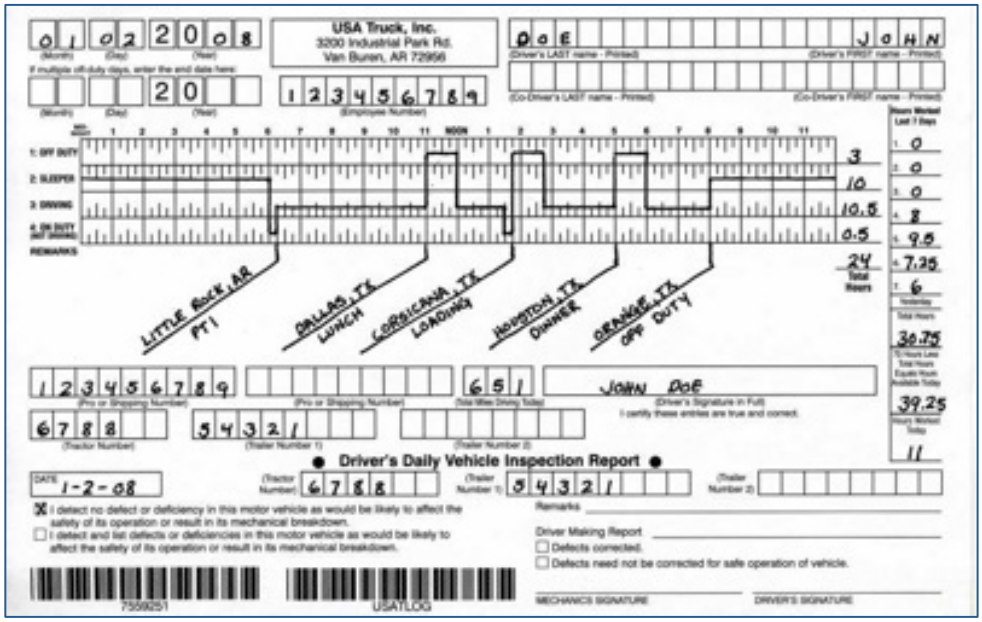


Figure 2.1. Sample paper logbook entry page. The driver records his duty status by drawing a horizontal line on the appropriate row of the grid, and manually calculates the hours spent in each status at the end of the row. (source: commons.wikimedia.org)

The daily log was initially mandated by the Interstate Commerce Commission (ICC) in 1940. The log contained lines for a driver to record his duty status, a section for a driver's remarks, and other general information about the carrier and driver. The ICC required that the log "bring out the essential facts" about where the driver had operated vehicles within a 24-hour

[2] The "graph grid" form was required and standardized by a 1982 Federal Highway Administration rulemaking (47 Fed. Reg. 53383 (1982)). The graph grid was intended to ensure uniformity in recordkeeping, thus easing enforcement of the hours-of-service rules.

period; how long the driver had been on duty; and how much of this on-duty time was spent driving. The driver was required to keep a copy of the log with him, and to file a copy with his carrier each day or upon returning from a trip; carriers were required to retain these logs for inspection. Though the form of the log was occasionally tweaked between 1940 and 1982, it remained, in its essence, a paper-based record of a driver's daily activity.

The graph grid is comprised of four rows, representing the four possible duty statuses a trucker may have: he may be off duty; he may be at rest in the truck's sleeper berth (similar to being off duty, but a status to which some additional time limitations apply); he may be driving; or he may be on duty, but not driving (e.g., conducting inspections, being loaded or unloaded). The driver records his duty status by drawing a continuous line across the grid in the appropriate row, to represent the period of time he spent in that duty status. When his status changes, he 'jogs' the line to the row for his new status, and records the name of the city (or highway milemarker) where the change took place. At the end of the day, the driver is required to tally the number of hours he spent in each duty status and compute the number of hours, if any, he has available for the following day. Drivers are required to keep the previous 7 days' worth of logs available for inspection, and must file their logs with employers within 13 days; employers must retain the logs for six months.[3]

However, for as long as these regulations have existed, truckers have fashioned ways to evade them by misreporting their hours. Drivers face strong economic pressures to maximize their driving time (Belzer 2000; Viscelli 2010). Drivers are typically paid on a per-mile or per-haul basis and thus have incentive to remain on the road even when exhausted (as truckers say,

[3] The method of recording a driver's duty status on the graph grid, and requirements for the filing and retention of drivers' logs, are set forth at § 49 C.F.R. 395.8(h),(i), and (k).

"if the wheel ain't turnin', you ain't earnin!'"), going to great lengths, including drug abuse and other unhealthy practices, to keep themselves awake.



Figure 2.2. Logbooks and other materials on sale at a truck stop.

Some employers impose deadlines that cannot be met if the rules are strictly observed, and independent drivers who negotiate with brokers for each haul may altogether miss opportunities for work if they toe the line too closely. Trucking firms may explicitly or implicitly pressure drivers to underreport their hours, in order to move goods at the pace of work demanded by the market. Thus, it is widely acknowledged that logbooks are routinely falsified (so much so that they are often dismissively referred to as "comic books," "coloring books," or "swindle sheets"); in a 1997 survey, only sixteen percent of drivers reported believing that logbooks provide an accurate depiction of drivers' activities (Belman and Monaco 2001). Law

enforcement officers at weigh stations can be avoided with relative ease, particularly when drivers exchange information among themselves via CB radio as to whether a station is open or closed (in CB slang, whether "the chicken coop is clean"), and plan their routes accordingly.

References in trucker popular culture suggest the ubiquity of these violations and the extent to which they are (not) taken seriously by truckers. Consider the 1963 trucker anthem "Six Days on the Road," written by Carl Montgomery and Earl Green and popularized by Dave Dudley ("*I.C.C. is checking on down the line* / *I'm a little over weight, my logbook's way behind* / *But nothing bothers me tonight* / *I can dodge all the scales all right* / *Six days on the road and I'm gonna make it home tonight*") or the 1975 hit "Convoy" by C.W. McCall (*"We tore up all of our swindle sheets / and left 'em settin' on the scales*").

Despite the ubiquity of tired trucking and the rulebreaking that accompanies it, trucker fatigue can have grave consequences. In one recent case, for instance, federal regulators shut down a trucking company after one of its drivers killed an Illinois Tollway employee and injured a state trooper while they were assisting another driver at roadside. A subsequent investigation revealed that during the twenty-six hours immediately preceding the crash, the driver had driven about 1,000 miles, and had rested for only between three and six hours (Grisolano 2014). In June 2014, the problem of fatigued trucking drew some public attention after a New Jersey crash that killed comedian James McNair, and seriously injured Tracy Morgan and four others. The truck driver is alleged to have worked without sleep for twenty-four hours straight before the crash (Cavaliere and Jones 2014).

Electronic monitoring of truck drivers' work hours

A potential solution to the problem of timekeeping violations is the use of electronic monitoring devices, integrated into trucks themselves, that create a record of the hours the truck is driven (as well as, often, other information about the truck and its driver's behavior, as I will describe). These devices—known as "electronic on-board recorders" or EOBRs—would partially automate the functions served by paper logs in efforts to curtail unsafe practices.[4]

Over the past 25 years, agencies within the Department of Transportation have initiated a series of rulemaking actions that have gradually integrated electronic monitoring requirements into the timekeeping rules. A 1988 regulatory action permitted *voluntary* use of EOBRs for compliance with the hours-of-service (HOS) rules; in 2003, a mandate for EOBRs in all trucks was proposed, but ultimately not adopted (for reasons including significant doubts about the efficacy and costs of such a rule). A 2010 rule mandated use for *pattern violators*[5] of the timekeeping rules, and a regulation currently under consideration (Federal Motor Carrier Safety Administration 2011) again seeks to mandate the use of EOBRs in *all* American trucks running long hauls. (See Table 2.1 for a timeline of the applicable regulations.)

These regulatory actions have generated vigorous disagreement within the trucking industry and related sectors. Though large trucking firms previously expressed greater hesitation

[4] It should be noted that, even when EOBR devices are used, their readouts are typically read manually by human law enforcement officers; thus, the enforcement of timekeeping rules is not entirely automated at this time. However, the device is very possibly a step toward more complete automation of the process via wireless integration and "virtual weigh stations" (Loftus 2008), somewhat akin to wireless transmission of information from an EZ-Pass device. FMCSA, in partnership with a number of governmental and educational partners and technology vendors, has recently completed the second stage of Wireless Roadside Inspection Program pilot testing, which is touted as promoting safety by enabling inspections to commercial motor vehicles 30 times as frequently as under current systems, as well as reducing traffic congestion and easing passage for truck carriers (see http://www.fmcsa.dot.gov/facts-research/art-technology-wireless-roadside-inspection-proof.htm). In addition, the feasibility of wireless transmission technologies for EOBR devices have been widely discussed in federal regulatory meetings I have attended.

[5] Under the 2010 rule, pattern violators are carriers with greater than a ten percent rate of noncompliance with hours-of-service rules. A carrier found to be in noncompliance at this rate would have been required to install EOBRs in all trucks in its fleet for a minimum of two years.

regarding EOBRs for a variety of reasons (including questions about accuracy and tamperability), they generally support the current proposed rule, as do insurance groups and public safety coalitions. But an EOBR mandate is ardently opposed by many (though not all) drivers and small companies, particularly independent owner-operators. Key points of disagreement in the debates include whether EOBR use will actually lead to safer practices, as well as the costs of the devices and service contracts, which must be borne by truck owners. Most crucially, however, stakeholders debate whether mandated electronic monitoring amounts to an infringement on driver privacy (for instance, by surveilling real-time location even when the truck is being used by a driver on his own time to drive to his home) or will facilitate illegal[6] driver harassment (for example, whether a remotely-monitored driver with time remaining "on the clock" will be pressured by his employer to continue driving even when, in the driver's judgment, he is too tired to do so, or when he judges road conditions to be unsafe for travel).

In August 2011, EOBR critics met with some success when the Seventh Circuit vacated the current electronic monitoring rule in force, citing concerns about the prospect of driver harassment, in *Owner-Operator Independent Drivers Association, Inc. v. Federal Motor Carrier Safety Administration* (656 F.3d 580 (7th Cir. 2011)). In response, device manufacturers and government regulators went "back to the drawing board" somewhat, in terms of both developing the next incarnation of the legal rule and in designing the technological device, to address these concerns.[7]

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[6] Truck drivers are statutorily protected against harassment via monitoring devices, though the devices may be used to "ensure [driver] productivity" (49 U.S.C. § 31137(a) (1994)).

[7] The Seventh Circuit decision vacated the 2010 EOBR rule, which applied only to "pattern violators" of the HOS regulations. However, in light of the court ruling, it became clear to FMCSA that the 2011 proposed rule (which would mandate EOBR use for all drivers, and which has not yet been finalized or gone into legal effect) would very likely face similar legal problems. As such, although the Seventh Circuit decision is not officially applicable to the 2011

In July 2012, President Obama signed into law the MAP-21 highway bill (Moving Ahead for Progress in the 21st Century Act, P.L. 112-141). Among its provisions, MAP-21 directed FMCSA to issue a rule requiring electronic logging in the trucking industry. The MAP-21 bill was the first Congressional action to require such agency action, and made some form of EOBR mandate essentially a foregone conclusion. In March 2014, FMCSA issued a Supplementary Notice of Proposed Rulemaking (SNPRM) in response to MAP-21's mandate; the rulemaking is currently ongoing in the agency. It is extremely likely that a mandate will be issued later in 2014, and will go into effect in 2015 or 2016.

Though EOBRs are not yet required within the industry, many truckers on the road today already use them. This is due to the fact that many large trucking firms currently use electronic *fleet management systems* (FMS) to track detailed information about their assets and employees, which are typically capable of recording and wirelessly transmitting many types of fine-grained data back to the "home office" in real time. Practically all FMSs on the market today include an hours-of-service module that monitors when the truck is being driven for regulatory compliance purposes (Fig. 2.3). In practice, then, EOBRs are very commonly *applications* bundled *within* fleet management systems, rather than discrete devices. As such, as FMCSA has recognized, "companies use [these devices] to enforce other company policies and monitor drivers'

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rule, it spurred the agency to reconsider that rule and the technical device specifications enumerated in it.

It did this in several ways. The Motor Carrier Safety Advisory Committee (MCSAC), a group primarily composed of industry representatives, law enforcement personnel, and other experts, was tasked with developing guidelines for FMCSA regarding how to ensure that EOBRs were not used to harass drivers, which included significant discussion of the technical capabilities of the devices (MCSAC Task Statement 12-01). Second, in February 2012, FMCSA announced (77 Fed. Reg. 7562-7564) its intent to issue a Supplemental Notice of Proposed Rulemaking (SNPRM) in order to seek additional public input specifically related to issues of privacy and harassment. In conjunction with the additional notice-and-comment period, the agency held public "listening sessions" in 2012, and conducted a driver survey related to these issues (the results of which have not yet been released).

behavior" (Federal Motor Carrier Safety Administration 2006:10) for purposes *other than* compliance with the timekeeping rules; moreover, the agency has based its legally required cost/benefit analyses on fleet management devices manufactured by Qualcomm (now Omnitracs), which has the largest market share, and could be manufactured at sufficient scale to meet the requirements of an industry-wide mandate. (Most independent owner-operators do not currently use the devices.)

Importantly for trucking firms, fleet management systems are capable of monitoring many types of bundled performance data in addition to timekeeping. The range of information captured commonly includes a driver's fuel efficiency and idling time, speed, geolocation and geofencing (notifying a dispatcher if a truck has departed from a predetermined route or arrived at a terminal), lane departures and braking/acceleration patterns, cargo status (e.g., the temperature of a refrigerated trailer), and vehicle maintenance/diagnostic information. In addition to monitoring and transmitting this performance data, fleet management systems typically contain additional modules that provide services like routing and two-way messaging.



Figure 2.3. A fleet management device with hours-of-service module displayed; EOBR driver interface. (source: omnitracs.com)

	MCP50	MCP100	MCP110	MCP200
AMBER Alert Highway Network	✓	✓	✓	✓
Analytics Manager	✓	✓	✓	✓
Critical Event Reporting	✓	✓	✓	✓
Fault Monitoring	✓	✓	✓	✓
Geo-Fence Capability	✓	✓	✓	✓
GeoServices	✓	✓	✓	✓
Hours of Service	✓	✓	✓	✓
In-Cab Navigation	✓	✓	✓	✓
In-Motion User Interface	✓	✓	✓	✓
On-Board Application Help	✓	✓	✓	✓
On-Board Tutorials	Text-based	Text-based	Text-based	Video
Performance Monitoring with Fuel Manager	✓	✓	✓	✓
Predictive Performance Service	✓	✓	✓	✓
Services Portal	✓	✓	✓	✓
Text-to-Speech Capability	✓	✓	✓	✓
Text and Macro Messaging	✓	✓	✓	✓
Vehicle Inspection Report	✓	✓	✓	✓
Vehicle Location Data	✓	✓	✓	✓
Audio Delivery		✓	✓	✓
Driver Workflow	Coming soon	✓	✓	✓

Figure 2.4. Feature bundling in fleet management systems. The “hours of service” capability represents the component of the system that addresses regulatory compliance. (source: omnitracs.com)

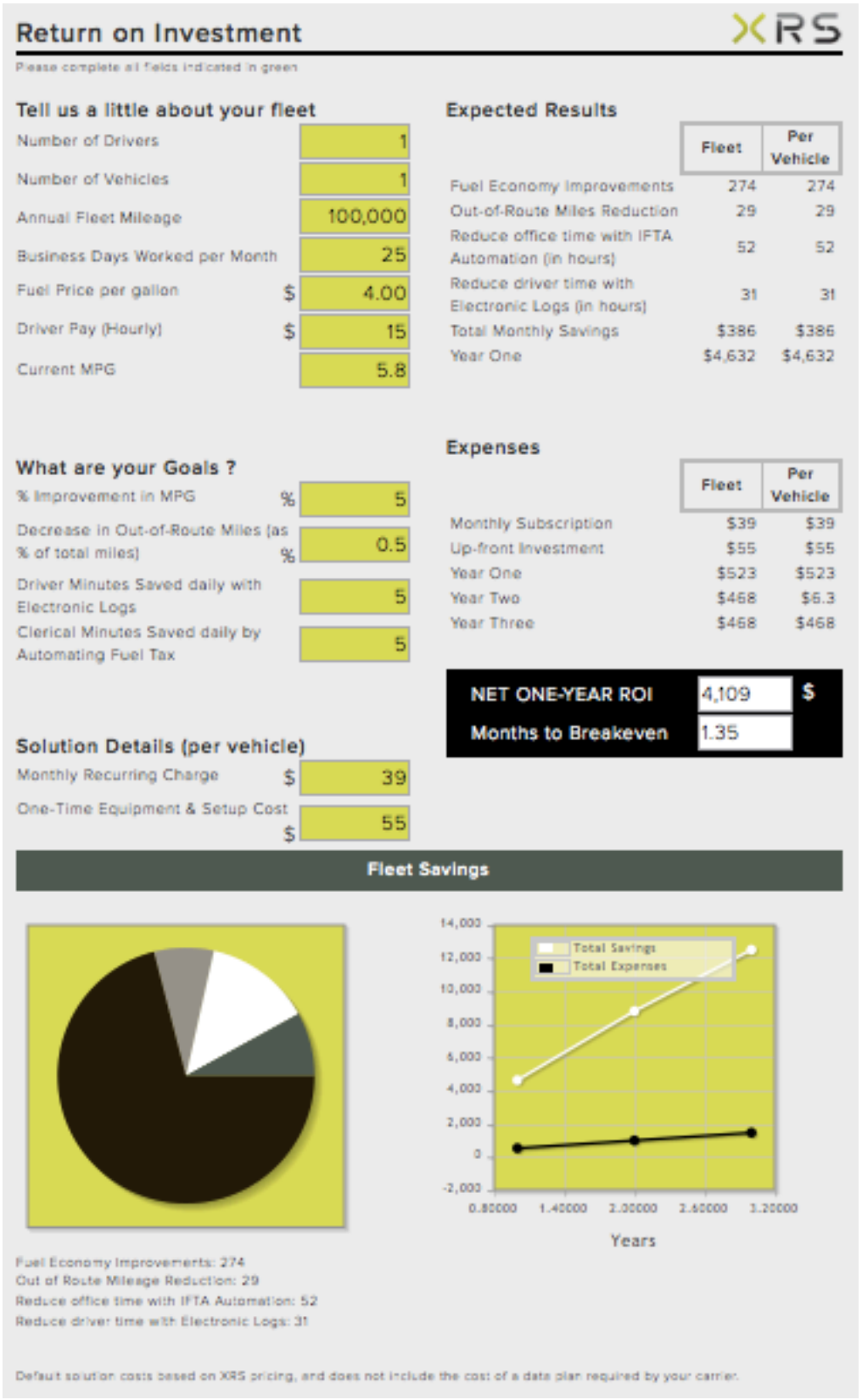


Figure 2.5. Large firms install EOBRs to capture efficiency gains. (source: xrs.com)

By current estimates, approximately 1 to 1.5 million EOBR units are in operation on the road today, and pervade close to half the trucking industry (heavily skewed toward trucks owned and/or managed by larger companies). Even in the absence of an EOBR mandate, market analysts estimate rapid further penetration over the next five years, with the number of units online expected to roughly double, particularly as devices' costs decline and capabilities increase over time. The mandate provides a business rationale for firms to monitor other driver behaviors not covered by the law: since they will be required to install EOBR hardware in their trucks anyway, the marginal expense of also monitoring (for instance) a driver's fuel efficiency is greatly reduced.[8]

A primer on the organization and political economy of trucking

The United States economy is fundamentally reliant on the trucking industry. Trucks, truck routes, and truckers themselves constitute the critical infrastructure on which markets for essentially every tangible good in the United States depend. A common saying in trucking is "if you got it, a truck brought it": even in the digital age, virtually every object each of us touches was—at some point, in some form—on a truck, being driven by a truck driver down a highway. The scope of the infrastructure is staggering. In 2004, 8.2 million trucks (including both light and

[8] It should be noted that firms face contradictory economic incentives regarding electronic hours-of-service recording: while firms do not want their fatigued employees to have accidents, they do want them to transport goods quickly. For large firms especially, the potential loss of employee productivity can be economically offset by safety benefits, reduced litigation risk, and savings on insurance premiums and internal auditing costs—as well as enhancements to efficiency supported by performance monitoring. In some cases, firms may instruct drivers about how to exploit the technical limitations of the monitor to evade the timekeeping regulations without being caught (for instance, by mis-logging time doing non-driving work, like vehicle inspection, as sleep time), as I describe in Chapter 6.

heavy models with at least six wheels) were registered in the United States, and drove an estimated 220.8 billion miles that year (Transportation Research Board 2010). Trucks transport billions of tons of freight each year (9.4 billion tons in 2012 (Department of Commerce 2012)), worth $10 trillion (Commercial Carrier Journal 2013). The volume of goods they transport is expected to increase in the coming years.

Key organizational divisions in the industry

For the uninitiated, trucking can be an extremely confusing industry to understand, marked by a multitude of terms and acronyms that connote different operational strategies and employment arrangements. I detail five important divisions briefly here to provide an idea of the scope and organization of the industry, and my research within it.

Long-haul vs. short-haul. First, trucking firms can be generally categorized by the length of a company's hauls. *Long-haul* operations (also called "over-the-road," or OTR) are generally interstate and occur over long distances, while *short-haul* operations are more local in scope (for legal purposes, restricted to within 100 air-miles of a particular location). The hours-of-service rules and the pending EOBR mandate apply specifically to long-haul operations, in which fatigue is of much greater concern; accordingly, my research is on the long-haul segment of the industry specifically.

For-hire vs. private fleet. A second axis of division is between for-hire and private fleet trucking. Trucking companies that are primarily engaged in the business of moving freight (companies like Werner, Schneider, and many thousands of small carriers) are considered *for-hire* carriers; that is, they are primarily engaged in the business of selling trucking services to

customers. However, nearly half the freight hauled in trucking in the United States is moved by *private fleets*, which operate in-house fleets within firms that are not primarily engaged in trucking (for example, Wal-Mart's trucking operations). In a sort of hybrid arrangement, trucking companies can also have *dedicated* operations, in which they haul much of the freight for a particular (non-trucking) company and often work out of on-site offices, but remain a separate organization. Though driver safety, fatigue, and turnover are issues in private fleets, they are generally somewhat safer and more stable than for-hire carriers ((Transportation Research Board 2010); their drivers more commonly drive dedicated (regular) routes, and the pace of work is more predictable and optimizable. My research primarily focuses on for-hire carriers, though I also spoke with drivers and other representatives of the private-fleet and dedicated segments.

Truckload vs. less-than-truckload vs. parcel. Third, trucking carriers can be categorized as *truckload (TL)*, *less-than-truckload (LTL)*, or *parcel* carriers. In truckload carriage, a truck is filled with one customer's freight at point A, and the entire freight is transported to and unloaded at point B (thus, sometimes called "point-to-point" carriage). LTL carriers haul multiple types of cargo for multiple customers in a single truck to multiple destinations, picking up and dropping off various loads along a route; freight loads are sometimes brought to one of the company's terminals by one driver and then transferred onto a different truck with a different driver, in order to achieve operational efficiency. Parcel carriers, like FedEx and UPS, carry large numbers of very small deliveries (primarily packages for businesses and consumers) along regular routes.

Most of the long-haul carriers with which I engaged in the research are in the TL segment (though I also spoke with some LTL drivers). TL carriers face greater market competition than do LTL carriers; LTL and parcel carriage require more established and complex infrastructure

(including a preexisting network of terminals and a critical mass of customers), while TL carriage has far lower barriers to entry (Transportation Research Board 2010). In TL trucking, economic competition and route irregularity contribute to the management and fatigue issues on which I focus in the dissertation. I do not focus here on issues in parcel trucking. Most parcel drivers are exempted from the federal fatigue rules, because they drive locally and are able to come home each night. However, technological management systems are pervading parcel trucking as well, as firms try to achieve operational efficiencies and maximize driver productivity (Goldstein 2014).

Big business vs. small business. Fourth, trucking represents a convergence of both large and small business interests. By count, over ninety-five percent of trucking firms are considered small businesses (operating twenty or fewer trucks), with about half operating only one truck (National Federation of Independent Business 2000). But by market share, trucking is dominated by a small number of very large carriers; twenty percent of trucking firms control approximately eighty percent of industry assets. My research focuses on both large and small carriers (as I describe in Chapter 3).

Employee drivers vs. owner/operators. A final key distinction in trucking concerns the types of employment arrangements that comprise the industry. Roughly speaking, there are two types of employment arrangements in trucking. A driver may be a traditional employee for a firm or private fleet (in which he drives a truck that the company owns), or he may be an independent owner-operator driving his own truck. Owner-operators (also called "O/Os") can compete for individual hauls, often via brokers or electronic "load boards," or may be leased to a carrier for a long-term period. Though high rates of driver turnover make exact counts difficult, one large study conducted by the University of Michigan in 1998 suggests that 74% of OTR drivers are

employees; the rest are owner-operators, some of whom have long-term lease arrangements with carriers (Transportation Research Board 2010:10).

The issues faced by employee and owner-operator drivers differ somewhat. Both are subject to the same legal rules relating to hours of service. And both are under tremendous pressures to maximize their driving time, though the nature of those pressures differs. Truckers who work as employee drivers may face direct pressure from their employers, who operate on razor-thin margins in a highly competitive industry, to break the law by staying on the road too long. In trucking, on-time delivery to the customer is paramount; adherence to federal safety rules is frequently trumped by companies' desire to maximize their employees' productivity by moving goods faster. In addition, employee drivers are far more likely to contend with fleet management systems (discussed in Chapter 4) through which their employers seek to increase operational efficiency and managerial oversight over their activities. Owner/operators do not face such pressures, but can lose out on opportunities for work altogether if they hew too closely to the rules. Particularly among owner/operators who negotiate each haul separately, there is strong economic pressure to accept a good haul offer; there is always someone else willing to break the rules to do so. My analysis in this dissertation considers both employee and owner/operator truckers.

Some economic research suggests that EOBRs might impact the distribution of employment and contractual arrangements in trucking by reducing the benefits of cost internalization (Baker and Hubbard 2004).[9] There is some value for firms in contracting with owner/operators, rather than employing their own drivers, because owner/operators internalize many of the costs of truck operation: they are (generally) responsible for purchasing their own

[9] The relationship between new monitoring capabilities and contractibility, including the the potential to form contracts around new types of behavior and to monitor contractual compliance in new ways, is explored thoroughly in Varian (2010).

fuel and repairing their own equipment, thus removing these costs for firms. In contrast, when a firm owns a truck that its employee drives, it must deal with these potential costs *and* the costs of motivating and training a driver to (for instance) drive the company's truck in a fuel-efficient and equipment-preserving way. However, these benefits are counteracted by owner/operators' improved bargaining positions relative to employee drivers; they can (in some cases) refuse undesirable hauls, and are often paid at a higher rate than employee drivers.

When on-board monitoring systems are used, however, the comparative value to firms of owner/operator contracting is reduced, because it becomes much easier and less labor-intensive for firms to monitor and incentivize employees' fuel use and driving behaviors. Because the cost internalization derived from owner/operator agreements becomes less salient, some research suggests it will lead to an increase in straight employment arrangements and a concomitant decline in the number of owner/operator contracting arrangements (Baker and Hubbard 2004).

Deregulation, competition, and collective bargaining in trucking

For most of American history, trucking was an economically regulated industry, in which prices and market structure were dictated largely by federal regulations. Since the passage of the Motor Carrier Act of 1935, trucking firms were under the purview of the Interstate Commerce Commission, or ICC. The ICC set rates within the industry and created protective barriers against new market entrants. In the 1970s, trucking was one of several industries targeted by a general political push for deregulation—that is, fostering economic competition over rates and working conditions—largely based on the assertion that the regulated nature of the industry was economically inefficient. Trucking deregulation began in 1977 by disassembling the regulatory

structures surrounding the industry, and was formally instantiated by the Motor Carrier Act of 1980, which permitted free market entry and allowed carriers to charge discount rates.

The post-deregulation combination of unfettered competition in a capitalist market, low wages, overwork, and unsafe and unhealthy working conditions have led Belzer (2000) to compare trucking work to "sweatshops on wheels." During the ten years immediately following the beginning of deregulation (from 1977 to 1987), truck drivers' wage rates declined by 44%, forcing truckers to drive much longer hours to make economic ends meet (Belzer 2000:8); from 1977 to 1995, drivers' average real earnings dropped by 30%, a decline four times that of (demographically comparable) workers in manufacturing production (Belzer 2000:21). A 1997 study by the University of Michigan Transportation Industry Program (UMTIP) suggested that non-unionized long-haul drivers make, at median, $10.75 per hour, and work 65 hours per week (a number of hours above the legal limit); 10% reported working more than 95 hours in the previous week (cited in Belzer 2000:37–8).

The fact that truckers are paid, typically, by the mile (rather than by hours worked or some other metric) is an effort to align the economic incentives of drivers with those of firms by encouraging them to maximize revenue-productive driving time and concomitantly minimize time spent not earning money for the company—waiting at terminals, completing repairs and inspections, taking legally required breaks, and the like. Before deregulation, many truckers (including those subject to Teamsters union agreements) earned hourly pay for non-driving time in addition to mileage pay; since deregulation, the market has "competed away" such pay, shifting the burden of market inefficiencies, unforeseeable delays, and mechanical risks to drivers.[10]

[10] Of course, there are myriad pay schemes in the industry, and some carriers *do* compensate drivers for non-driving time, particularly in light of the shortage of labor in the industry. Non-

Law has, to date, provided little recourse for truckers' economic bind. Truck drivers are explicitly exempted from the Fair Labor Standards Act (FLSA) (29 U.S.C. § 213(b)(1)), the federal statute intended to prevent labor exploitation by entitling workers to overtime pay, minimum wage standards, and other protections. And because enforcement of hours-of-service regulations has to date been relatively weak and infrequent, it fails to provide a meaningful check on drivers' overwork.

Collective bargaining, too, has proved a relatively weak instrument for protecting truckers' labor interests. Unions were initially a significant force in trucking in the 1920s and 1930s; in fact, the term "teamsters" stems from the practice of "team" driving (initially horsecart driving) in the precolonial period. Unions remained influential during the era of economic regulation, in part due to the fact that carriers lacked strong incentives to resist unions (since they were not setting rates competitively), despite connections to organized crime and corruption (in large part connected to Jimmy Hoffa's representation of the Teamsters during this era).[11] In the early 1970s, trucking was one of the most unionized American industries, with over 80% of workers in unions. Union power declined sharply with the advent of deregulation, as unions were forced to make concessions in light of the newly competitive nature of the industry, widespread rate and wage declines, and the flood of new market entrants. Belzer (2000:44) suggests that the overall rate of union membership among truck drivers declined from 60% to 25% in the last twenty-five years.

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driving compensation can occur either systematically or on an *ad hoc* basis; for instance, at some of my observations in trucking firms, dispatchers had discretionary authority to authorize drivers for additional pay in particular circumstances (e.g. total mechanical breakdowns), or to authorize them for per diem expenses (like meals, a truck stop shower fee, or motel room). Belzer (2000:140-1) describes additional pay schemes in the industry, including pay per stop and pay by the weight of freight.

[11] For a thorough exploration of collective bargaining in trucking, see Viscelli (2010).

My own interactions with truckers bore out a common distaste for unionization, seemingly based in part on the general perception that unions presented bureaucratic limits on truckers' occupational independence, of which they are generally quite protective. As one driver put it, "[a union] doesn't appeal to me. I just like my freedom and just do what I got to do." Another told me he did not like hauling to the east coast because he perceived a stronger union presence there; he shared a story in which he was making a delivery to a construction site and faced a confrontation over whether the work was union-protected.

> [I] got everything ready [to unload]. And the guy comes up and says this is a union job. And I … went ahead and continued doing what I done. And he said, you got a union card to operate that crane? I says, nope. I says, I'm not union and neither is my truck. So he says well, I told you that it's a union job. And I says yeah, and I told you congratulations. He says well, you gotta have a union card to operate this crane. And I said, no I don't. I said I told you, unless you're deaf, I'll repeat it again, and I said, you know, me and my truck are not union. The stuff that I'm hauling here is not union. And it is mine 'til it touches the ground. . … *I don't have to go by none of your rules*, you know, until it touches the ground. … You just run into problems like that on the east coast a lot. And so I just, I just don't care to deal with it. (emphasis mine)

As a result of the post-deregulation economics of the trucking industry, drivers participate in what Belzer calls "self-sweating"—collaborating in the process of exploiting their own labor, in varied ways that I address in more detail in Chapter 6. In so doing, truckers recall the working-class boys described by Willis (1981), whose cultural practices support and re-entrench the very structures that ensure the continued exploitation of their labor.

A paradoxical effect of economic deregulation is that it has compelled an *increase* in what Belzer terms "social regulation"—federal rules, structures, and bureaucracies that govern firms' practices and truckers' working conditions within the newly competitive market,

especially around issues like driver overwork and fatigue. Social regulations have increased markedly in trucking since economic deregulation.

A myriad of controls on truckers' day-to-day activities come from the Federal Motor Carrier Safety Administration (FMCSA), the federal administrative body (within the U.S. Department of Transportation) responsible for issuing and enforcing regulations involving commercial motor vehicles. In the name of furthering the agency's safety mission, the FMCSA brings dozens of details of a truck driver's workday under the purview of federal regulations. These details stem from strict training and licensure requirements and screenings, to restrictions on the hours a trucker can drive and the paperwork he must keep as evidence of his compliance, to the thorough vehicle inspection he must perform and document each day. The FMCSA issues rules about how much noise a driver's truck can make, what type of fuel he may use to fill it, and what he may transport in it. Some of the rules pertain intimately to the driver's body. Truckers must submit to drug and alcohol testing, and must pass mandatory licensure physicals ensuring they are in good enough health to drive. The FMCSA will likely soon pass a regulation requiring drivers with body mass indices (BMI) over 35 to submit to mandatory screenings for sleep apnea.

The trucking labor market

The trucking labor market is marked by significant churn. The rate of driver turnover in the industry currently stands at around 100% per year for large carriers and 80% for small firms (Transportation Research Board 2010). Multiple factors contribute to the high rate of driver turnover (some of which I address in more detail in Chapter 6, in discussing industry or firm exit

as forms of resistance). A key driver, though, is that harsh working conditions make the job undesirable in light of its low wages and overwork. On average, long-haul drivers return home only once every three weeks (Belzer 2000). The work is isolating, physically grueling, and statistically dangerous: trucking has the eighth highest occupational fatality rate of all American jobs (Bureau of Labor Statistics 2012a; Smith 2013) and truckers deal with a number of health challenges presented by fatigue, the physically demanding nature of the work (long hours spent sitting, punctuated (for some drivers) with straining loading/unloading of freight), and the difficulty of maintaining a healthy lifestyle while living on the road and eating at truck stops.

Truckers also frequently hop between firms, seeking better wages or more desirable hauls; comparing tips on what different companies are paying or how many hours one can get is a common topic of small talk at truck stops and over the CB. These moves are relatively low-stakes, because the nature of the work is largely fungible (driving for one firm is essentially similar to driving for another), the driver shortage means rehiring is easy, and the mobile nature of the work means a new job does not disrupt auxiliary social commitments that accompany other sorts of workplaces (Becker 1960).

The life and culture of the truck driver

Culturally, truck drivers comprise a fiercely independent occupational group, and particularly resistant targets of social control. Though there is clearly a good deal of social variation within a profession comprised of over three million people (Bureau of Labor Statistics 2011), truck driving maintains strong cultural traditions that are reflected in drivers' attitudes,

behaviors, and professional identities. I describe these values here, as they bear on how organizational control is manifested within the industry.

Demographically, truckers are blue-collar workers, of relatively modest economic means: their median annual income is around $38,000 (Bureau of Labor Statistics 2012b). The population is approximately 15% Black, 19% Hispanic, and 2% Asian (Bureau of Labor Statistics 2013). Fifty-one percent graduated high school; 19% have less than a high school education; 19% have some college training; and 11% have an associates', vocational, or four-year college degree (Belman, Lafontaine, and Monaco 2005).

Chief among the cultural traditions of trucking is a strong emphasis on independence and freedom. When I asked drivers about what attracted them to truck driving, many remarked that the autonomous nature of the job—the ability to make one's own day-to-day decisions about how to accomplish daily work tasks, to work hard without having a boss peering over one's shoulder, the "lone wolf" nature of the work—deeply appealed to them. As a trucker explained his work to Axel Madsen (in Hamilton 2008:195–6), "what I like about truckin' is that even if you drive for someone else, there ain't anybody standing over you when you're out there on the highway." Some drivers tell me they came to trucking after having conflicts with authority figures in these more traditional employment settings; as a trucker put it to Will (1992), "truckers ain't organization people!"

Many drivers, of course, have worked in offices or factories before, or have worked under close supervision in the military or in agriculture. For illustration, consider the employment history of Adam, a newly retired 64-year-old driver with fifty years of trucking experience. Adam began driving flatbeds and combines on his family's ranch in Oregon when he was ten years old. At twelve, he drove his first semi, his family's double-decker cattle hauler, in

which he would transport cattle from the ranch to the stock pens at the nearby railhead. Adam served in the Navy, where his trucking experience secured him jobs driving buses and trucks, both in Vietnam and in Japan, where he drove a prisoner transport bus between airbases. After his military service, Adam drove freight trucks and tractor-trailers for carnivals across the western United States, until his retirement three years ago.

Truckers' independence is thoroughly bound up with the rhetoric of the open road. There is romance in the way truck drivers describe the trip across the Rocky Mountains, or how the sunrise looks as they drive across the Great Plains. And many drivers talk with pride and satisfaction about how many corners of the United States they have seen in the course of their work—views far more majestic than the drab walls of a cubicle or the factory floor.

Perhaps unsurprisingly, truckers' attitudes toward bureaucratic rules (both governmental and organizational) tend to be derisive. A strong libertarian streak runs through much of their political rhetoric. They are generally contemptuous of what they see as removed "ivory tower" institutions meddling in citizens' private business.

Yet, despite their desire for independence and escape from the strictures of conventional work environments, truckers encounter more day-to-day involvement with behavioral regulation than the average person. Some of these entanglements are based on firms' organizational rules and employment and/or leasing arrangements. Others stem from the fact that truckers' daily work takes place largely on federal highways; it is on the system of public roads—with their speed limits and traffic controls, insurance and licensure requirements, and laws about seatbelt and cell phone use—that most of us feel the presence of behavioral rules most directly. Add to this the additional highway rules that apply specifically to truckers (designated "no-truck" routes, weight and height clearance limitations, fuel tax regimes) and the dozens of details of the

trucker's workday regulated by the federal government, and the "open road" begins to appear much less open.[12]

It is worth noting, too, that many truckers interface closely with government in their leisure activities, as well as in their work lives. Among the truckers I met, a number told me that they enjoy outdoor activities like hunting and fishing when they are not at work. Like truck driving, these pursuits also seem like independent, unencumbered activities—yet, like truck driving, hunters and fishermen also deal with a host of state regulations, including required licenses and stamps, restrictions on the times and places in which particular types of activity can take place, and rules about what can be hunted or fished and with what tools. Like trucking, the seemingly open, free nature of hunting and fishing mask a tangle of rules and regulations.

The coupling of truckers' desire to escape the constraints of authority, along with their participation in an inherently mobile, blue-collar occupation (and sometimes leisure activities) marked by deep regulatory infrastructures, makes truckers an intriguing population to examine as targets of regulation—and, particularly, of regulation that aims to substitute technological control mechanisms for truckers' human autonomy, decision-making capability, and self-knowledge. My research here is informed by rich previous studies of trucking culture (Hamilton 2008; Will 1992; Ouellet 1994) and economy (Belzer 2000; Viscelli 2010); it updates this literature in light of the changing nature of trucking work, and focuses anew on the proliferation of information technologies to enact regulatory and organizational control in the industry.

[12] Compare Hamilton's (2008) characterization of the "dense web of weigh stations, ports of entry, reams of paperwork, layers of taxation, and contradictory regulations" with which truckers must contend.


CHEVROLET
Motor Division-General Motors Sales Corporation
PRESENTS
KNIGHTS
on the
HIGHWAY
The Jam Handy Organization


KRISTOFFERSON AND MacGRAW...
AIN'T NOTHIN' GONNA GET IN THEIR WAY!
CONVOY
EMI films presents
A ROBERT M. SHERMAN Production
KRIS KRISTOFFERSON · ALI MacGRAW "CONVOY"
BURT YOUNG also starring MACKE SINCLAIR · FRANKLIN ADEE and ERNEST BORGNINE as Sixty Lyle
Edited by GRAEME CLIFFORD · Screen Story and Screenplay by B.W.L. NORTON · Executive Producers MICHAEL DEELEY and BARRY SPIKINGS
Produced by ROBERT M. SHERMAN · Directed by SAM PECKINPAH · PANAVISION®
United Artists
A Transamerica Company
Read the Dell Book · Based on the record "CONVOY" by C. W. McCall
"CONVOY"


Truckin' is one thing,
High-Ballin' is another,
and the way they do it is something else!
HIGH-BALLIN'
Stanley Chase/The Panico Company/Jon Slan
presents
PETER FONDA
JERRY REED
in HIGH-BALLIN'
Co-Starring Helen Shaver · Chris Wiggins
Executive Producers STANLEY CHASE and WILLIAM HAYWARD · Original Music Scored by PAUL HOFFERT
Story by RICHARD ROBINSON and STEPHEN SCHNECK · Screenplay by PAUL EDWARDS
Produced by JON SLAN · Directed by PETER CARTER
Color prints by MOVIELAB · An AMERICAN INTERNATIONAL Release
PG PARENTAL GUIDANCE SUGGESTED


A JOB TO DIE FOR
ICE ROAD TRUCKERS
SUNDAYS 9/8C
HISTORY MADE EVERY DAY


AMERICAN TRUCKER



Figure 2.6. Cultural iconography of the trucker: *Knights on the Highway* educational film (1938), *Convoy* (1978), *Highballin'* (1978), *Ice Road Truckers* (contemporary), *American Trucker* (contemporary), carthrottle.com headline (1 July 2014), Viagra commercial (2011).

Trucking and manhood

The cultural iconography of the trucker evidences some of the values, tropes, and mythologies inherent in the community. The trucker (nearly always male) is depicted as strong, rugged, and robust; the truck itself operates as a mechanical extension of his masculinity.[13] The size, weight, and power of the machine he controls helps to define and legitimate the trucker. (Compare also Connell's (1995:45–47) discussion of the metaphor of men's bodies *as* machines, 'hardwired' to engage in certain dominant behaviors.) As Hamilton (2008:200) puts it: "Especially for someone with little education and limited economic opportunities, the sense of

[13] The connection between masculinity and machinery, particularly regarding vehicles and driving, has been drawn in a number of other contexts, including drag racing, young drivers, and risky traffic behaviors (see, e.g., Best 2006; Chappell 2012; Miller 2001); trucking represents a particularly acute connection since it is also connected with notions of occupational autonomy, sexual practice, and economic provision.

control that came with piloting a big rig could make a man feel that he, as an individual, mattered."

In trucker culture, the trucker is portrayed as being unafraid of danger, sexually virile, unfettered by social ties, and—importantly for our purposes—wily enough to outsmart and overcome the misguided and bungling efforts of law enforcement officers or bureaucratic rules. In addition to visual representations, like those depicted in Figure 2.6, country music has had a key role in forming truckers' self-identity, even as it creates stylized mythologies of what day-to-day trucking life is actually like. As Hamilton's (2008:109-10) brilliant history of such representations explains:

> [M]usicians who recorded early trucking songs adapted country music's long-lived theme of the 'wanderer.' By singing about stopping at a 'roadhouse in Texas / A little place called Hamburger Dan's,' Terry Fell helped promote the idea that a trucker's life consisted mainly of playing pinball while sipping coffee poured by a red-headed waitress. The truck driver, as a man in control of his time and possessing an untamed sexuality, was the antithesis of the 'organization man' or the 'man in the gray flannel suit' or the member of the 'lonely crowd' that sociologists of the 1950s identified as the primary victim of an increasingly corporatized, bureaucratic urban society. Few truckers would have taken Terry Fell's song as an accurate representation of their work culture, yet few would dispute that the sense of mobility that trucking provided was an important attraction of the work. When a man's workplace was the road, a trucker took no orders from the factory foreman and faced no line speed-ups or stopwatch-toting scientific managers.

Truckers' emphasis on freedom and independence correlates with the gendered nature of the trucking workforce. The trucking population is at present about 95 percent male (Bureau of Labor Statistics 2013). Masculinity is a highly valued trait, and manifests itself in a number of ways. Some of my trucker informants are self-described "family men," with strongly professed Christian values and traditional notions of gender roles, who proudly show me pictures of

children and grandchildren they are helping to provide for through their labor. For others, masculinity expresses itself as machismo—some truckers tell me boastfully about their varied sexual exploits as their work takes them across the country. This "cowboy" mentality is evidenced in classic trucker films, like *Smokey and the Bandit*, *Convoy*, and *White Line Fever*, which glorify disregard for (usually corrupt or inept) authority figures, and which feature strong, virile truckers as leading men. No matter how it is manifested behaviorally, being "manly" seems to be a particular point of pride for the truckers I meet, and bound up closely with the independence of the job.

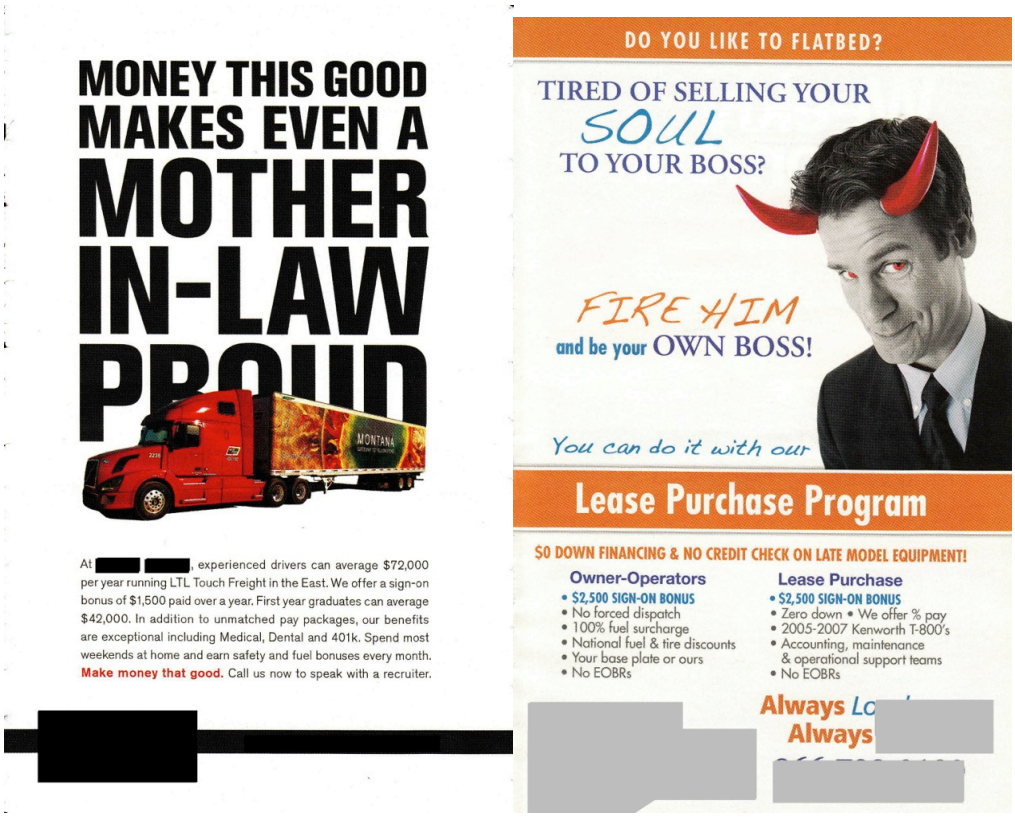


Figure 2.7. Trucker recruitment advertisements play upon both the necessity of providing for one's family and the desire to escape a traditional "boss."

My categorization of truckers into "cowboys" and "family men" is congruent with Stratford et al.'s (2000) study of HIV risk factors among long-haul truckers, in which he and his

colleagues characterize their subjects as risk-taking "highway cowboys," more moderate "old hands," and "Christian truckers/old married men," who exhibit the least risky behaviors and have the most stable family relationships. Consider also Hamilton's (2008: 199) characterization of popular trucking culture in the 1970s viewing "working-class manhood as a constant negotiation between the poles of promiscuity and fidelity."

Sleep is for the weak

The masculinity of trucking work has particular salience around issues of fatigue. Working while tired can be construed as "evidence of dedication and personal strength" in certain social contexts (Balkin et al. 2011), which is intimately connected to notions of masculinity. As Derickson (2013) describes in his book *Dangerously Sleepy: Overworked Americans and the Cult of Manly Wakefulness*, deep American historical roots connect Protestant notions of hard work, manliness, virtue, and success with the denial of sleep. The idea that "sleep is for sissies" finds expression in occupations as diverse as investment banking, software coding, factory work, aviation—and truck driving. The lack of sleep, and the lengths to which truckers will go to stay awake, have long been glorified in truckers' "war stories" and in cultural media. Consider Dave Dudley's famous confession in "Six Days on the Road" that "I'm takin' little white pills / My eyes are open wide" (referring to amphetamines). In the 1930s, truckers reportedly relied on all manner of tricks to stay awake, as a National Safety Council research paper (described in Derickson (2013:114)) reported: "Ammonia as an inhalant is useful, but its effect is not lasting. Some drivers are even reported to resort to sipping urine in emergencies." Some truckers "us[ed] an onion to moisten dry eyelids"; Others "would light a cigarette and sleep until it burned down and awakened them by scorching their fingers," as reported by Jimmy

Hoffa in 1936, in marshaling trucker fatigue as a motivation for enrolling truckers in collective bargaining arrangements (Derickson 2013:122).

Randomized drug testing in the industry seems to make drug use a somewhat riskier solution to fatigue in the modern era, though several of my informants told me that stimulants can still be purchased under the counter at many major truck stops; moreover, the use of legal stimulants like Five-Hour Energy and Red Bull is extremely widespread.



Figure 2.8. A variety of legal stimulants for sale at a truck stop.

Lack of sleep is a way for truckers to demonstrate masculinity through stamina. In Ouellet's study, he describes how truckers reproach one another for not being man enough to "stay in the saddle" (1994:134), and notes that "the use of amphetamines was a part of company culture … [truckers] also displayed a certain pride in endurance that was reflected by a slang

term peculiar to them, 'doing the double.' This term denoted working two consecutive shifts[.] … [T]he driver who couldn't stay in the saddle … was seen as lacking skill (endurance)" (1994: 134-6).

Truckers' performance of masculinity as stamina, along with the cultural iconography and "cowboy" identity that attend the profession, can be understood in part as cultural glosses necessitated by trucking's political economy. As I have described, truckers take part in the exploitation of their own labor by "self-sweating" and by resisting or circumventing safety regulations on the basis of economic necessity. As I describe further in my discussion of resistance (Chapter 6), much of the machismo, and the "fun and games" of outsmarting law enforcement, as depicted in truckers' casual discussions and in cultural icons, is posturing that masks deep economic necessity.

One trucker I spoke with described this far more powerfully than I ever could. As I was wrapping up our interview, he stopped me to interject:

> It's just for me, when you talk about breaking hours of service, and you talk about running multiple log books, and you talk about, you know, electronic regulation and things like that, … [it's] important for me to touch upon the financial conditions which produce, like, that kind of behavior[.] I mean, it's not a tenable situation without some kind of help. You know, it's not something that you could do. And there are a lot of men out there who, there wouldn't be food on the table, frankly. And the lights wouldn't be on at home if they weren't breaking the law and if they weren't using drugs. And it's not about having a party, because it's not a fucking party. It's very much not a fucking party. I mean, you're driving something that weighs from about 65,000 to maybe 100,000 pounds. You can go into a ditch. You could crash into somebody. You could rear-end someone. And you've been awake for 20 to 30 hours. There's nothing fun about that. … You're looking in the rear-view mirror. You're looking in the ditch for a smokey. You're worried about the chicken coops being open. It's not fun. That's not fun.

Trucking and technology

Truckers do not fit the stereotype of a technology consumer or early adopter. Their rural backgrounds, relative lack of formal educational credentials, and blue-collar work engender relatively little attention from technology consumer markets; when they are considered, they are sometimes constructed as uneducated rubes.

In fact, many truckers are quite savvy technology users. Their constant mobility gave rise to an early need to use communications technologies to talk to family and friends at home. Truckers were the primary adopters of citizens band (CB) radio, which remains in heavy use. And trucks themselves are, of course, complex technological artifacts, which truck drivers routinely tinker with, personalize, and repair.

A word should be said, too, about how technology could fundamentally transform trucking by eliminating the need for truck drivers entirely. The economics of the industry, along with emergent technical capability, make trucking a prime target for the use of autonomous (self-driving) vehicles in the coming decades. Though significant legal and social hurdles remain (Bilger 2013), self-driving cars are quickly becoming technically feasible. Trucking would be a sensible sector in which to begin using driverless vehicles (Stromberg 2014), for several reasons. Trucking already features a strong federal regulatory infrastructure that would be necessary for implementation. Autonomous vehicles are best prepared for highway driving. And major drivers of cost and human inefficiency in the industry (like driver turnover, fuel overuse, and concerns about driver fatigue) would be eliminated in the absence of drivers.

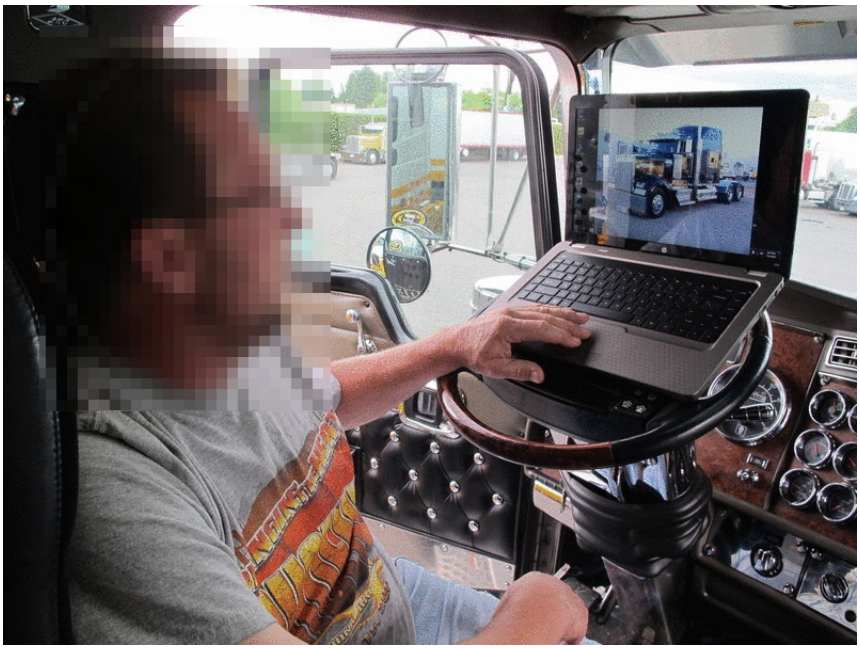


Figure 2.9. A trucker demonstrates how he uses his steering wheel as a laptop stand when the truck is stopped.

Technologies that wrest control away from truck drivers in one way or another—whether through real-time data transfer, mechanical limitation (e.g., speed governors that electromechanically limit the maximum speed at which trucks can be piloted), locational tracking, or the creation of seemingly objective accounts of drivers' activities—clearly challenge the cultural mythologies that have arisen over the last several decades in the industry. As I have described, understanding trucking as a work process is only one facet of what trucking means to those who engage in it. Trucking is an enactment of masculinity, a form of economic provision, and an extension of sexuality. For working-class men in particular, "bodily capacities *are* their economic asset" (Connell 1995:55); both these forms of integrity are jeopardized by technologies that reduce truckers' economic autonomy in the name of purported biological deficiency (fatigue).

Trucks are understood by their drivers both as workplaces, free of meddlesome bureaucratic oversight, and as homes in which privacy and independence are sacrosanct. To a far greater extent than in many other workplaces in which technological monitoring has pervaded to enact greater managerial control, deskill workers, or maximize productivity, in trucking such monitoring clashes acutely with truckers' collective and individual self-definition and occupational identities, built up over decades.

In other words, the EOBR, with its emphasis on perfecting legal compliance and maximizing top-down operational efficiency through the construction of a data-driven account of action, represents a fundamental misalignment with the norms and values of the trucking community. The EOBR *inscribes* its users with a predesigned set of goals, motivations, competencies, and moral (and legal) judgments (Akrich 1992); when these assumptions are poorly matched in the real world, they must be explicitly confronted. Those negotiations are the focus of this dissertation.

Timeline of Major Regulatory Actions Involving EOBR Devices, 1987-2014

Blue boxes represent the time period of regulatory consideration between the administrative agency's initiation of public comment on a proposed rule (via an Advanced Notice of Proposed Rulemaking (ANPRM) or Notice of Proposed Rulemaking (NPRM)) and the issuance of a final rule. Green lines represent agency interpretations of rules. Red lines indicate judicial actions vacating agency rules. Rulemakings shown: FHWA-MC-130; FMCSA-1997-2350; FMCSA-2004-18940; FMCSA-2010-0167.

Table 2.1. Timetable and summary of EOBR-related federal regulations.

Chapter 3. Research Methodology

A multiple viewpoint approach is essential to a nuanced understanding of the struggles underlying any technological development (Gillespie 2007; Howard 2002; Pinch and Bijker 1984), particularly one that occurs against a landscape marked by competing institutional logics. Over the course of two-and-a-half years (from the summer of 2011 to the close of 2013) I sought to understand the development and use of EOBRs, and the trucking industry more generally, from the perspectives of multiple stakeholders. The EOBR is simultaneously a legal, technological, organizational, and cultural object;[1] in order to explore how these domains interact and compete in practice, it was important to me to allocate my research efforts across them. As such, rather than conducting intensive in-depth ethnographic work at a single site, I have opted for an approach that provides a breadth of viewpoints via distributed, multi-sited fieldwork (Hine 2007; Marcus 1995). In total, research for this project took me to eleven states, and took place in a wide range of settings: from truck cabs to law offices, corporate "war rooms" to rest areas, fancy hotels to truck stop bars. My ethnographic fieldwork, detailed below, was supplemented by 77 unstructured interviews with respondents; these took place both face-to-face and by telephone. These contacts were either derived from direct fieldwork, or based on referrals from prior informants.

[1] Of course, these are not the only lenses through which the EOBR case can be viewed, and I had to select perspectives to prioritize in my research (based, in part, on the accessibility of data). One can imagine, instead, telling a political history of the device; though I touch on the political frameworks that undergirded the system's development, I draw on relatively little data from Congressional hearings, or reports from explicitly political figures on issues like the provision for an EOBR mandate in a federal highway funding bill (HR 4348, 2012). Alternatively, one could understand the EOBR from a labor history perspective: though I address labor/management issues in Chapter 4 and draw from research involving the independent drivers' association and some interaction with Teamsters leadership, the day-to-day history of union involvement with work-monitoring devices is not a story I focus on here.

Generally speaking, my data come from three interrelated spheres: truck drivers, trucking and technology firms, and legal and regulatory actors. I expand on each below.

Truck drivers

The experiences and viewpoints of truckers, as the targets of regulation via EOBR systems, are the focus of the research. I spoke with and observed truckers at a number of sites. I made multiple visits to large highway truck stops in two states, and spent four days among tens of thousands of truckers and trucking enthusiasts at the nation's largest trucking trade show. I interviewed drivers in break rooms at the firms where they worked, and chatted with them at additional, incidental sites, like trucking supply stores. I often approached drivers directly to ask them to participate in the research; in other cases, meetings were arranged with the help of a third party, like the driver's firm or a personal contact.

I supplemented my firsthand observation with several other data sources about drivers' experiences. I read hundreds of articles from trucker-oriented media sources, including magazines, newsletters, and radio programs. I joined the Owner-Operator Independent Drivers' Association and monitored the daily communications it sent to members. I kept tabs on drivers' online activities, including YouTube channels and active bulletin-board-based communities on which drivers shared information, opinions, and complaints.



Figure 3.1. Checking out a big rig at the truck show.



Figure 3.2. At the truck show.

Trucking and technology firms

I also examined EOBRs from organizational perspectives, particularly those of trucking companies and technology firms. During on-site field visits to four trucking firms—including both top-10 carriers and very small operations—I talked to managers, safety directors, trip planners, dispatchers, trainers, and other personnel. Two of these firms used exclusively electronic logging systems; another was in the process of integrating it into their operations; and another used exclusively paper-based systems. At one large firm, I sat in the company's central "war room" and was permitted to listen in on dispatchers' real-time conversations with drivers.



Figure 3.3. A display of devices at a fleet management conference.

To understand the perspectives of technology firms that developed EOBRs, I attended fleet management conferences and seminars, a three-day trucking technology summit, and several interactive online training sessions presented by EOBR vendors for trucking companies. I spoke with trainers, account managers, and consultants to learn about the capabilities and challenges of deploying monitoring technology within trucking firms. I also reviewed a wide range of relevant industry literature, including policy whitepapers, engineering reports, training materials, product manuals, and marketing literature dating back to the 1970s.

Legal and regulatory actors

I draw as well from multiple legal and regulatory sources, including analysis of thousands of documents related to four federal Department of Transportation (DOT) rulemakings involving EOBRs, from 1987 through 2013.[2] These documents include cost/benefit analyses conducted by federal agencies, studies on truck safety and driver fatigue, and public comments submitted by interested parties (drivers, trucking firms, representatives of interest groups, and many others) offering opinions and evidence about EOBRs intended to influence pending regulatory decisions.

In addition, in 2011 and 2012, I observed three days of meetings of the Motor Carrier Safety Advisory Committee, an advisory board consisting of regulators and industry stakeholders, as well as two DOT-sponsored "listening sessions" (one in person and one via webcast) intended to solicit the opinions of drivers on pending regulations. I also considered

[2] A topic modeling analysis based on these documents is the subject of Chapter 7. Because the methods used for that analysis are distinct from those used in the rest of the research, I describe that methodology in detail in that chapter.

judicial opinions, party pleadings, and recorded oral arguments in important EOBR-related court cases,[3] and interviewed lawyers and lobbyists working on EOBR-related issues.

The law enforcement community was another area of focus. I spent five days at an internal conference of the commercial vehicle enforcement community, where I spoke with dozens of troopers, sergeants, and representatives of state departments of transportation responsible for EOBR-related enforcement. In addition, I observed truck inspections firsthand during two days embedded in the commercial vehicle enforcement unit of a state police organization. Though this is less firsthand inspection observation than I would have liked, the experiences I observed were largely confirmed by evidence triangulated in other venues (e.g., from interview data, documentary evidence, and conversations with law enforcement officers in other venues). I read law enforcement documents and viewed online seminars providing training for inspection processes. I spoke with dozens of truck drivers about their inspection experiences. I read regulatory documents in which members of the law enforcement community voiced policy opinions about the development of EOBRs, and heard law enforcement representatives represent their perspectives at regulatory advisory meetings and at federal listening sessions. These data sources form the basis of Chapter 5.

Additional research participants

Before beginning the dissertation, I knew very little about trucking, its occupational culture, and its legal and organizational structures and practices. In an effort to understand a full range of perspectives and to situate the EOBR debate more broadly in the context of the industry,

[3] The most important of these cases is Owner-Operator Independent Drivers Association, Inc. v. Federal Motor Carrier Safety Administration, 656 F.3d 580 (7th Cir. 2011).

I spoke with a wide variety of people whose lives are, in various ways, tied up with trucking—sometimes about EOBRs specifically, and sometimes about trucking generally. In addition to the primary spheres I describe above, a variety of other people and entities served as resources, including insurers, trucking historians, logistics companies, academic researchers, and truckers' family members.

Research strategies: subjects, surveillance, storytelling

Every research endeavor is beset by project-specific challenges to which the researcher must attend in order to minimize bias and ensure the validity of collected data. In the interest of methodological transparency, I note here a few complexities that I encountered over the course of the research, and the strategies I used to address the complications they introduced.

Subjects

Ethnographic data are never gathered entirely evenly, and the different groups with which I interacted for this project necessitated slightly different research approaches.

Truck drivers are simultaneously everywhere and nowhere. Trucking companies are located in every city, and truckers can be found at any truck stop or rest area. But because drivers are constantly on the move (both physically, in the nomadic course of their work, and organizationally, between employment for different firms), it was not generally feasible for me to have sustained contact over time with individual drivers. Instead, my interactions with drivers

tended to be singular 'snapshot' encounters.[4] As such, I was not able to study longitudinally changes in particular drivers' career trajectories or engagement with the relevant technologies (for instance, talking with a particular driver both before and after an EOBR was installed in his truck). Rather, I spoke with and observed many drivers at many times and locations to gather data about how the field as a whole is being affected by these changes.



Figure 3.4. A driver explains his logbook to me.

My relationships with non-driver interviewees could be and often were more sustained. Some of my visits to trucking firms and encounters with law enforcement officers consisted of multiple days of observation, during which I developed relationships with dispatchers,

[4] There were a few exceptions to this rule. One driver and I spoke on the phone multiple times and also exchanged a number of emails, including photographs he took in the course of his work. In addition, I encountered some drivers more than once on different visits to a truck stop; drivers (especially those with regular routes) often develop patterns of patronage at certain truck stops, based on personal preferences, social connections, loyalty programs, and/or company rules about preferred fuel vendors.

executives, and other research participants. In many cases, I contacted these participants via email after my visit to clarify particular points in my fieldnotes, or to get their reactions to data I had gathered in some other context. In several cases, too, participants contacted me independently when (for instance) their company announced a policy change with respect to technology use, or they located documents they thought I might find informative.

Surveillance

Empirical studies of surveillance are beset by the difficulty of observing a "zero state." Because the researcher, in asking questions of a research subject or monitoring behavior, is *herself* acting as a surveillor, it can be complicated to determine what behavior under an unmonitored state would look like—a methodological challenge akin to the Hawthorne effect, in which subjects modify their behavior (usually by improving it) as a reaction to the fact of being observed (Monahan and Fisher 2010). I quickly learned that asking participants many detailed questions about surveillance might introduce bias into my interviews—or at the very least, make research participants uncomfortable and likely less forthcoming, particularly around issues of illegality and resistance. If a truck driver, for instance, was particularly sensitive to the idea that the 'powers that be' were keeping track of his behaviors, my probing questions about his potential violation of legal rules—and perhaps even his illicit circumvention of technological controls—were sure to cause him to temper his responses in defense, and might also make him feel uncomfortable. Even though I was acting as an agent of neither the government nor any of the drivers' employers, I found that many drivers have a generalized distrust of authority and an unclear perception of what entities have access to what EOBR-derived data.

These difficulties were somewhat exacerbated by my institutional affiliation when I began the research. I first interviewed drivers in the summer of 2011 when I was working as a Research Intern at Intel Corporation's Interaction and Experience Research Lab (IXR). To my knowledge, Intel had (and still has) no explicit business interest in EOBRs; they permitted me to do the research under their auspices because of their interest in social aspects of technology use generally, whether those technologies were Intel-based or not. I explained this when I introduced myself to potential research participants, and directed them to sign and initial a number of dense consent documents, as Intel required me to do. But I cannot help but think that it must have been a discordant and potentially intimidating experience when I explained that I was working for a technology company and wanted to ask sensitive questions about their use of a controversial and vaguely understood technology to circumvent the law. This particular difficulty resolved when my internship term ended, so that I no longer had to introduce myself with this affiliation.

I used several tactics to allay discomfort around my own surveillance of drivers' practices, in addition to affirmatively reminding participants about the confidentiality of our interactions. I initially anticipated audiotaping all of my interviews, but quickly noted that the presence of my tape recorder was a source of discomfort for surveillance-wary participants—so I generally did away with audiotaping, instead taking detailed notes during and after interviews. I learned to rephrase questions in order to avoid putting participants on the spot about illegal or unsanctioned practices (for instance, instead of asking a driver "how do *you* cheat on your logbook?" I would ask "what types of things have you heard that *other drivers* do to falsify their logbooks?"). Allowing participants to attenuate their responses in this way enabled them to share information about their own practices without the risk of self-incrimination, and also had the benefit of providing me with a fuller picture of industry practices beyond those of the specific

research participant. Of course, it also potentially opened the door to less reliable data based on hearsay rather than firsthand experience. I address this risk and the steps I took to minimize it in the next section.

Storytelling

Trucking lends itself to storytelling, and truckers enjoy regaling each other (as well as the occasional interested researcher) with tales of roadside hijinks, clever workarounds in the face of technological or organizational ineptitude, and endurance of oppressive conditions. Some of these accounts certainly and intentionally deviate somewhat from reality, whether embellished due to the teller's braggadocio ("I drove for 48 hours straight!"),[5] strategically misstated in order to avoid incriminating oneself or others for unsanctioned behaviors (as I alluded to in the previous section), or for some other reason. It can be quite difficult for the qualitative researcher, as outsider, to evaluate the accuracy of informants' claims—a complication that owes as much to the researcher's inherent biases and limitations as to the behaviors of research participants (Duneier 2011).

Of course, the subjectivities and emic understandings of research participants are valuable in their own right, and the stories themselves thus provide a informative source of data distinct from other accounts (Morris et al. 1999). Rumors about technologies embody a "process of collective interpretation" (Burrell 2011:17) about those artifacts, which demonstrates the capacities of user groups to reconfigure what technologies mean to them; thus, truckers' accounts

[5] By no means do I intend to impugn my research participants' characters by noting this occurrence. In Chapter 2 I discuss the relationship between masculine bravado and the economic necessity of drivers' behaviors.

of (for instance) what EOBRs could and could not track were important for me to understand the EOBR as a cultural object.

But in order to make my own etic evaluations about industry practices, I also needed to disentangle these accounts from actual behaviors and capabilities as much as possible. As Van Maanen (1979:548) describes this imperative, "the ethnographer must continually assess the believability of the talk-based information harvested over the course of a study, an evaluation dependent upon the fieldworker's interest, skill, and good fortune in uncovering lies, areas of ignorance, and the various taken-for-granted features of the studied organization."

To do so, I depended on two primary strategies to probe the accuracy of my data and improve the validity of the research (Guion, Diehl, and McDonald 2011; Seale 1999). First, I privilege accounts that I heard multiple times from different actors, especially differently situated actors. For instance, most of the methods of sociotechnical resistance that I detail in Chapter 6 were shared with me by multiple drivers, and in many cases were also independently reported to me by trucking firms and law enforcement officers. Second, whenever possible, I triangulated participants' direct reports with data derived from other contexts, especially contexts in which the data were initially produced for a non-research purpose. Common sources for such triangulation included online bulletin boards (on which drivers conversed anonymously with one another about EOBRs and related practices), industry press, technical specifications for products (e.g., tamper-proofing efforts provide confirmatory evidence that tampering occurs), and legal and regulatory documents. The more corroborative evidence I could gather from diverse contexts, the more confidence I derived about the existence of a given practice.

Interactions and researcher identity

The dimensions of a researcher's personal identity necessarily shape her interactions with research participants, as well as what is learned in the field (Davies 2008). My status as a young white female researcher in a working-class, male-dominated environment impacted the study in important ways (Paap 2006)—including, perhaps, some of which I am not aware. In the interest of reflexivity and transparency, a few words are in order about how my own characteristics affected the tenor of my interactions with research participants, as well as the course of the research more broadly.

The great majority of my research participants were male, particularly my trucker participants; that group was racially mixed but primarily white, and ranged in age from "baby truckers" in their early 20s to "old hands" in their 80s. Because trucking is a predominantly male profession (and a particularly "macho" one at that), it is commonly assumed that women do not know much about how trucking works. This stereotype certainly held true for me when I began the project; I had no working knowledge of truck driving in terms of either its broad legal and economic organization or the day-to-day mechanics of trucking labor. As the research progressed, of course, my knowledge grew (though certainly there is quite a bit that one can only learn from actually working in the industry, which I did not do, but others have (Ouellet 1994; Viscelli 2010)). Over time, I developed a better sense for the pressures inherent in the job and the structure of the industry, deciphered trucker slang, and worked out the technical and regulatory infrastructures underlying electronic monitoring in the industry. But my youth and gender facilitated my "playing dumb," to some degree, about these intricacies in my interactions with drivers.

Allowing research participants to explain anew concepts that I understood enabled me to understand how they themselves understood key issues at play, without imposing my own impressions onto the interaction. This was essential for uncovering mistaken perceptions, such as those about the monitoring capabilities of electronic devices. It also served a more instrumental purpose by easing my interactions and building rapport. Many research participants, particularly truckers, have a host of knowledge that they are very happy to share with whomever is interested enough to listen; explaining the ins and outs of their work to a newcomer seemed to be enjoyable for them. Because I appeared non-threatening, respondents generally seemed fairly candid and enthusiastic to share their experiences. Though I lack a counterfactual, I would surmise that many of my male research participants were more likely to assent to spending time talking to a young female than they would have been if I had had different characteristics.

I never lied to research participants about who I was or why I was interested in them, and I am confident that I did not abuse the trust of any research participant. But I was selective in what I revealed to them about myself. In addition to sometimes "playing dumb" about the trucking industry, I also only rarely mentioned my status as a lawyer, which I think would have changed how participants viewed me.

My gender, in particular, sometimes served as a methodological obstacle as well as an asset. Truckyards can be loud and disorienting places with limited visibility, and I had to think about personal safety in doing my research. Some of the trucking firms and other places I visited were also concerned about my safety (and presumably their potential liability), and so would only let me talk to drivers or walk around truckyards if I brought a male companion with me for security. Though I was grateful for the protection, this also limited my access: for instance, if my

"guard" were unavailable, I could not accompany drivers to their trucks to see their electronic equipment firsthand.

A final gendered twist arose when I became pregnant over the course of the research. As my pregnancy became outwardly apparent, it too both helped and hindered my research efforts. In some cases, particularly with female informants, it helped me to establish personal rapport. In others, it was limiting: for instance, one law enforcement agency refused to let me observe inspections in light of my pregnancy; it also made it rather more difficult for me to share a beer with a research participant in a truck stop bar, as I had done previously.

As this chapter makes clear, ethnographic research is always messy, and demands that the researcher be willing continually to reshape her methodological approach based on different subjects, types of data, and specific challenges of the situation as it presents itself. In addition, she must attend to the ways in which her own presence and personality shape the direction of the research and her interactions with subjects. However, ethnographic work is uniquely suited to the project at hand, and allowed me to develop a nuanced view of the meanings of EOBRs as they are situated within multiple institutional domains.

Chapter 4. The Contexts of Control: Information, Power, and Truck Driving Work[1]

Organizational control is increasingly carried out via technological monitoring. Systems that enable comprehensive surveillance of employee activities obviate the need for reliance on managerial fiat and other resource-intensive tools for generating compliance with an organization's aims. As monitoring technologies continue to become lighter and cheaper, we can expect them to proliferate across workplaces and into new settings, where fine-grained control over employees' labor had previously been impracticable: from prompting nurses to wash their hands (Boyce 2011) to preventing restaurant servers from stealing meals (Pierce, Snow, and McAfee 2013), electronic surveillance is fast becoming a favored tool for enforcing workplace rules.

But *how* do these systems operate to exact organizational control? In this chapter, I explore how electronic monitoring systems reorient information flows in trucking firms. As extant research on technology, information, and work might suggest, I find that managers make use of electronic monitoring (and the data it generates) to control workers by making their day-to-day practices more visible and measurable. But the pathways managerial control takes in this setting are surprising, as the data are put to multiple and seemingly incongruous uses. First, monitoring *abstracts* knowledge from local and biophysical contexts to aggregated databases—arming managers not only with new barometers for comparative performance assessment, but also with a trove of evidence with which to challenge truckers' accounts. Second, organizations enact control by *resocializing* electronically-derived information, strategically deploying it into

[1] An article version of this chapter is currently in press (Levy forthcoming).

employees' social lives—truckers' relationships with their coworkers and families—in order to pressure employees into compliance with organizational aims. The simultaneous operation of these multiple dynamics enables managerial control over these mobile workers in a manner that was not previously possible.

Information systems and control over work processes

Information systems have long been used to exercise managerial control over workers within organizations (Ball 2010; Beniger 1986; Kling 1996; Yates 1993). A chief mechanism for such control is the *abstraction and rationalization* of knowledge, a dynamic initially documented in the realm of industrial production (Braverman 1974; Zuboff 1988). Traditional craftsmanship and manual labor are embodied, process-driven, and contextual (what Zuboff terms "action-centered"); even contemporary professionalized work very often depends on direct local or biophysical perception of cues (consider Daipha (2007) on weather forecasters and Bailey et al. (2012) on auto engineers) and embodiment as a tool for knowledge construction (Myers 2008; Prentice 2005, 2007; Vertesi 2012).

Yet information technologies often attenuate the connections among work, local context, and embodied knowledge. They may do so by automating jobs previously dependent on bodily skill, by breaking up process-based knowledge into discrete, rationalized, low-skill tasks, by abstracting actionable knowledge from the physical site of labor to centralized databases and global considerations, and/or by increasing managerial surveillance over workers (Braverman 1974; Kallinikos 2007; Sewell 1998; Zuboff 1988). Workplace information technologies facilitate the creation of *digital accounts* (Scott 2006). By converting work practices into

ostensibly objective, morally neutral records of human action, information technologies legitimate certain types of knowledge and experience, while rendering others invisible and non-actionable (Bowker and Star 2000; Markovits 2001)—all to potentially detrimental effect on worker power.

The use of technological monitoring and data analytics as a means to discipline and control employees assumes many different guises, most commonly through governance strategies like measurement, classification, and ranking (Espeland and Stevens 1998; Foucault 1977, 1980; Sauder and Espeland 2009), generally relating to efficiency, productivity, and profitability. These tactics make work processes knowable to remote parties by operationalizing job performance as a set of calculable, commensurable metrics, and making the employee's actions both visible and (by implication) governable (Covaleski et al. 1998; Langfield-Smith 1997; Miller and O'Leary 1987; Stanton 2000; Townley 1993).

Information technology is particularly integral to managerial control practices when workers are dispersed in space, rather than directly observable. As industries expand their geographic reach, remote managers increasingly rely on information communication systems to control far-flung resources, including employee activities (Beniger 1986; Law 1986; Yates 1993). The need for coordinated, universalized information infrastructures can create challenges for local implementation when locally situated variation comes into conflict with the imperatives of standardization—as when the situated knowledge of workers 'in the field' of cannot be easily integrated into the formats required by IT systems (Rolland and Monteiro 2002), or when such abstraction diminishes or decontextualizes what can be perceived through physical presence at remote worksites (Bailey et al. 2012; Jonsson, Holmström, and Lyytinen 2009). Distributed work

situations thus pose special challenges for technologically-mediated worker control, in that managers are both physically and conceptually distanced from field knowledge.

Yet, even as these information flows flatten some contexts, information remains grounded in, and contingent upon, the social worlds in which it operates. Social relationships and structures affect the impacts of technologies, the manners in which they are interpreted by human actors, and the organizational uses to which data are put (Barley 1990; Kelley 1990; Orlikowski 1992; Thomas 1994; Wajcman 2013); information does not exist in a social vacuum. As such, technological abstraction of work processes is not the *removal* of context, but the *redefinition* of context to create new meanings and to implicate new social orders (Kallinikos 2007; cf. Esposito 2004).

Investigating organizational information practices in trucking

Information and communication technologies are often vaunted for making work less spatially contingent and thus more mobile (Forlano 2008; Nippert-Eng 1996), as digital information-sharing tools supplant the need for physical co-location. But trucking has never been co-located: it is inescapably and definitionally mobile.

This position makes truckers an ideal group through which to examine technological control in the present moment of distributed computing. As I described in Chapter 2, demographically, truckers are blue-collar laborers, not so dissimilar from the production workers whose work rapidly became rationalized, specialized, measured, and surveilled via technologically-oriented management strategies (Braverman 1974; Sewell and Wilkinson 1992; Townley 1993; Zuboff 1988). But until very recently, truckers' spatial distribution meant that

managers were unable to supervise their work processes directly. The fundamental mobility of truck-driving work, combined with the exigencies and contingencies inherent in highway travel—weather, accidents, and the like—has enabled truckers to retain more day-to-day occupational autonomy than many of their blue-collar brethren in non-mobile work settings. Trucking represents a unique setting for the investigation of organizational control, then, due to this combination of inherent spatial mobility with the blue-collar and intrinsically physical nature of trucking labor.

As described in Chapter 2, though EOBRs are not yet legally mandatory, they are in use by roughly thirty to fifty percent of the industry now (as estimated by industry experts). Adoption is heavily skewed toward larger firms, in large part due to the bundling of performance tracking and analytic capability into the same hardware/software packages as legal compliance features–in other words, the EOBR is typically a module within an integrated fleet management system (FMS). It is these performance-monitoring features of the system that are most attractive and useful to large trucking firms, and which form the focus of much of this chapter. But the legal mandate remains an essential part of the story, by reducing the marginal expense firms incur for monitoring drivers' performance behaviors; since they will soon have to install EOBRs anyway, the purchase of the system can be treated as something of a sunk cost.

Electronic monitoring and information flows

Fleet management systems reorient organizational information flows across three closely related, yet analytically separable, dimensions. In this section, I describe these shifts.

Aggregation

When fleet management systems are used to monitor truck drivers' work routines, aggregated information comes to supplant local and biophysical self-knowledge in terms of organizational value. Traditionally, truckers' value and a good deal of their occupational pride arises directly from their knowledge, often gleaned from years of experience, of the daily "ins and outs" of driving a truck—from how trucking equipment works and how to fix it quickly when repairs are needed, to local conditions that affect work routines (what roads are closed, what time of day traffic is the most onerous in various locations), to routing information (how many miles it takes to get from Omaha to San Francisco, and the "best" way to get there depending on weather conditions). Truckers—especially "old hands" (Stratford et al. 2000) with millions of driving miles under their belts, who have been on the road for years or even decades–take pride in sharing this knowledge over CB radio, and show considerable pleasure in regaling one another (as well as the occasional researcher) with detailed stories of how such knowledge has benefited them in some manner or another on the road, and in describing their knowledge of the best routes without needing to use technological "crutches," like GPS, as support. Consider the following exchange I had with one driver about how to get from Oregon to Indiana:

Q: *So you don't use GPS though?*
A: GPS? No. Honey, I've been driving for twenty-nine years, I've been all over the United States, I don't need a GPS. I don't even need a map.
Q: *You don't use a map?*
A: [*laughing*] No.
Q: *Really?*
A: Hell, no. I could drive–where do you want to go?
Q: *West Lafayette, Indiana.* […]
A: Go around Ontario, Oregon, over to Pocatello. Go south on Pocatello, go to McCammon, that's 30, it runs—McCammon runs over to 80, I-80, that'll come out by Little America, take Little America—or the 80, excuse

> me—run that over to Chicago, right? Get through Chicago, now from there it's up to you which way you want to go. […] You'd have to go south on 65, down towards Indianapolis. […]
> *Q:* *So how do you learn all this [about different routes]?*
> A: Honey, driving them.

Exchanges like this were common in my interactions with truckers, as were "war stories" about drivers' experiences navigating particularly knotty routes or demanding timetables over the years. Truckers also described ways in which their own knowledge trumped the ineptitude of other human beings, like dispatchers or inspectors, or the shortcomings of technologies themselves, like faulty routing equipment. "Road knowledge" gleaned from years of experience serves as a clear source of value and professional identity for these workers.

Pride in accumulated "road knowledge" extends, too, to bodily self-knowledge about how fatigued a truck driver feels. Numerous drivers articulated strong resistance to being told what their own individual biophysical limits are. As two drivers put it in regulatory comments:

> A computer does not know when we are tired, [f]atigued, or anything else. Any piece of electronics that is not directly hooked up to my body cannot tell me this. … I am also a professional [and] I do not need an [EOBR] telling me when to stop driving … I am also a grown man and have been on my own for many many years making responsible decisions!

> I'm not going to work under conditions where I'm treated like a child, a child who doesn't have enough [sense] to know when to go to bed and when to get up; or when to stop and rest while rush hour traffic clears and then proceed when rested and safer.

For many drivers, then, professionalism and occupational pride are deeply entwined with knowledge of biophysical and local conditions, which have long been of primary value in the effective completion of their work tasks. But the value of these forms of knowledge is displaced

by fleet management systems that provide services such as automatic routing and geolocation, remote diagnostics, geofencing, hours-of-service monitoring, and tracking of other fine-grained indicators like fuel use and hard braking incidents. These modules accumulate and summarize information in order to create detailed performance metrics for drivers (Figs. 4.1 and 4.2). Comparisons can be easily made for different periods of time, both within and across drivers, across groups of drivers (as defined by back-office managers on any basis: managers can compare customizable driver groups based on type of equipment, type of haul, driver experience level, or any other imaginable axis of variation), or between a company's fleets and industry averages. This aggregated information, summarized in quantifiable and easily comparable metrics, becomes a highly valued management tool produced by means of the sociotechnical system, one that large trucking companies spend millions of dollars to acquire, install, and manage.

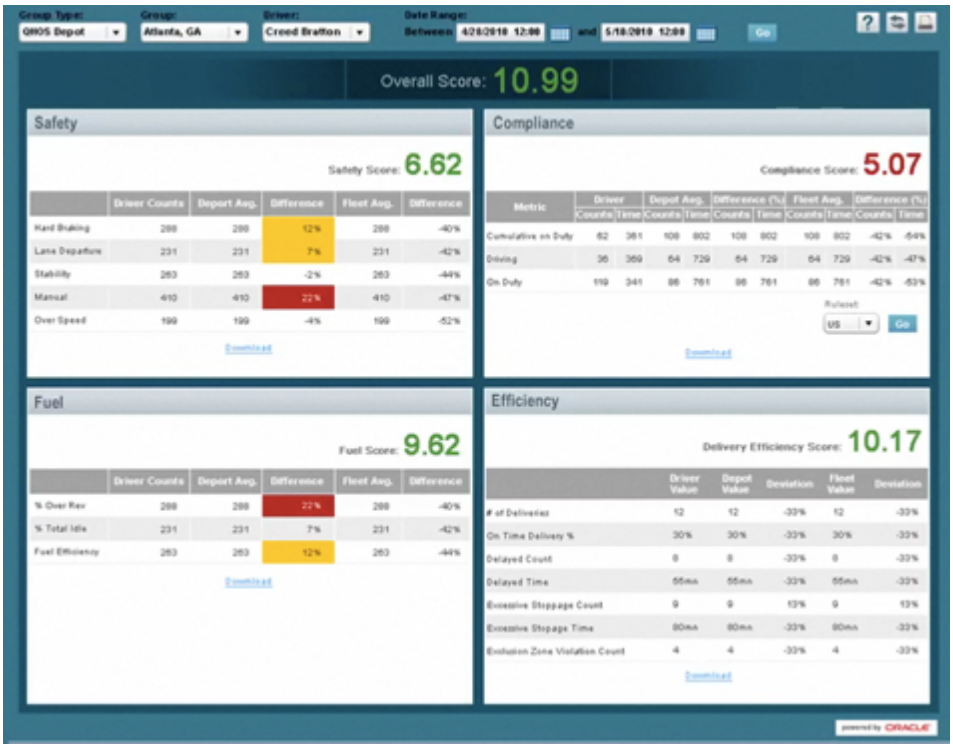


Figure 4.1. Sample driver "scorecard."

Entity	Hard Braking Count	Lane Departure Count	Manual Count	Roll Stability Count	# Miles Driven	Safety Score *
JOE	1	0	0	3	5,679	-250,263%
JILL	1	0	0	0	5,529	-83,388%

Figure 4.2. Sample comparison between two hypothetical drivers' safety scores.

Exclusivity

A second dimension of change concerns *who* possesses actionable information. When monitoring systems are used, truckers are no longer the sole holders of relevant information, as monitoring systems distribute it to remote dispatchers. Truckers themselves still possess knowledge of their work activities, but they are no longer its *exclusive* possessors.

Traditionally, a driver (even an employee driver of a trucking firm) is considered the "captain of his ship": like captains of other transportation vessels, the trucker holds the ultimate authority to stop driving if, *by his own judgment*, he is too fatigued to do so, or if local weather or road conditions make continued travel unsafe. Drivers are accorded a high degree of autonomy in deciding when and how to conduct their work, which is closely bound up with the emphasis on local and biophysical knowledge. Indeed, many drivers report that this decision-making independence is what initially attracted them to the profession, and it serves as a strong source of professional pride.

Yet, when fleet management systems are used to transmit information from trucks to dispatchers at an employer's home office, employers have much more information at their disposal—both aggregated data about drivers' performance, as described, but also additional information that imputes to the dispatcher knowledge about the driver's internal and local

conditions. Under the "ship captain" model, a driver may declare authoritatively that he is too fatigued to drive; but when the driver's hours-of-service are monitored by a fleet management system, a dispatcher may respond to the effect that "I know you aren't (or shouldn't be) too tired, because I can see that you've only been on duty for five hours." Similarly, a driver may state that a road is currently impassable due to weather conditions; his dispatcher may respond that "I know the weather is not *too* bad for you to continue driving down I-80, because I see that I have four other trucks on that road now." (Each of these examples was reported to me as having occurred.)

To illustrate, in one exchange that received attention in industry media (Tanner 2013), a driver received the following string of messages while on a legally mandated sleep break (emphases mine):

12:57 pm	Firm:	Are you headed to delivery?
1:02 pm	Firm:	Please call.
2:33 pm	Firm:	What is your ETA to delivery?
2:34 pm	Firm:	Need you to start rolling.
2:35 pm	Firm:	Why have you not called me back?
3:25 pm	Driver:	I can't talk and sleep at the same time.
3:37 pm	Firm:	Why aren't you rolling? ***You have hours*** and are going to service fail this load.
3:44 pm	Firm:	***You have hours*** now and the ability to roll–that is a failure when you are sitting and refusing to roll to the customer.
3:51 pm	Firm:	Please go in and deliver. We need to service our customers. Please start rolling. They will receive you up to 11:30. Please do not be late.
4:14 pm	Driver:	Bad storm. Can't roll now.
4:34 pm	Firm:	Weather Channel is showing small rain shower ***in your area***, 1-2 inches of rain and 10 mph winds ???

Here, the dispatcher repeatedly invokes his knowledge of the driver's status and location ("you have hours"; "in your area"), and challenges the driver's local assessment of conditions

with his own remotely-retrieved data (dispatchers commonly plug a driver's GPS coordinates into weather or map websites).

Of course, the fact that the system makes it *possible* for dispatchers to override drivers' judgment does not mean that they *always* do. Based on my observations in trucking firms and what drivers reported about their experiences, there is significant variation in the degree to which firms question drivers' judgment based on the data at their disposal, particularly when safety is at stake. However, it is also likely that the fact that the data are being collected—the reality of which drivers are very much aware—prevents drivers from making claims that the data would not support: it is difficult for a driver to say he is out of driving hours in order to avoid an undesirable load assignment, because he knows that those data are readily accessible by dispatchers and trip planners.

Interestingly, one trucking firm purposefully de-links hours-of-service data from the software used by their dispatchers, so that "drivers have to tell us how they are managing their hours and the next time they will be available for dispatch. … Bottom line is our drivers are the captain of their ship. They tell us what they can do, not the EOBR data." This use underscores the heterodox use of any technical system and the paramount importance of organizational context in determining how such systems impact social and economic relationships (Barley 1986; Orlikowski 1992). However, this situation was unique in my research; in most cases, it appears that dispatchers are given ready access to information about drivers' location and legally available hours, in order for these data streams to be utilized as managerial tools.

Temporality

Third, the systems enable a temporal shift in information flows, as information is distributed in real time. Under current rules, a trucker is officially required to keep his paper logs up-to-date at all times by updating the log each time his duty status changes (e.g., when he begins driving for the day, stops for lunch, or arrives at a shipper's terminal). But in practice, a significant lag exists between a driver actually recording information on his paper log and a dispatcher *having access to information* about hours worked. A driver using paper logs is required by federal regulations[2] to submit his paper log to his employer within thirteen days of its completion; it is common practice for drivers to submit their paper logs at the conclusion of a trip, and for drivers to be well-behind on their recordkeeping during a haul. This lag time gives the driver ample opportunity to make adjustments to the form before submitting it to his employer, which therefore gives him "wiggle room" to appear compliant in *post facto* records, whether or not his actual driving behavior was in fact actually in line with legal rules (which it frequently is not).

[2] 49 C.F.R. § 395.8(i).



Figure 4.3. A driver makes calculations for his paper-based logging system.

One driver, Fred, described to me how the paper-based system afforded him flexibility:

Q: *So, did you have to keep track of your time before you got the Qualcomm?*
A: Yeah.
Q: *How'd you do it?*
A: With a logbook. But in a logbook . . . it works pretty well, because you can chisel parts off here, and parts off there, and you make the whole trip fit perfectly.
Q: *So, when you say you're chiseling, does that mean that you're twisting it a little?*
A: Well, you do a fifteen-minute pre-trip [inspection]; then you get caught in traffic for, like, an hour. You can give up a meal break, you can give up an equipment check, and that covers that hour.
Q: *So, you just fudge it a little bit.*
A: That's it.

When Fred refers to "giv[ing] up" a meal break and equipment check, he means that he would *record* a rest break and equipment inspection in his paper logbook, but not actually take the time to perform these activities. Rest breaks and equipment inspections are legally required,

and it is thus in his interest to report having completed them; the time it takes a driver to complete them counts against his 14-hour daily work limit but *not* the crucial 11-hour daily driving limit. By "chisel[ing]" these activities off, Fred uses the saved time for additional driving. In this way, Fred would gain an extra hour of driving time without recording it on his log.

Under the paper logbook system, then, it is common for a driver's timekeeping records to be well behind, and to be reconstructed after the fact to portray compliance regardless of actual behavior. This lag time thus becomes a source of power for a driver like Fred to complete his work tasks more or less as he sees fit, without regard for minute-by-minute accounting to his employer or other parties. (In this respect, the arrangement bears resemblance to the ship captains of the East India Company, as documented by Erikson and Bearman (2006), who show that the spatial and temporal distance between captains' actions and reporting to central offices facilitated captains' regular malfeasance.)

But when fleet management systems are used to track a driver's hours of service, this information is transmitted in real time back to employers. Information about where a driver is, whether he is moving and how quickly, and how long he has been on the road or on a break is constantly updated. Using a "breadcrumb" map view, dispatchers can watch all of a fleet's truck drivers move across the country in real time, and can see all drivers' to-the-minute drive time data in an orderly spreadsheet as it happens. The real-time nature of this information distribution means dispatchers can see violations as they happen, and can even anticipate violations *before* they occur. Some systems' dispatcher portals turn a driver's data cell red when he is within a few minutes of a violation, visually flagging the driver so that a dispatcher can respond immediately by communicating with and directing him as to his next course of action. Drivers accordingly

have less decision-making autonomy to determine how to handle the situation if a violation is about to occur. Moreover, because drivers no longer have thirteen days to strategically "correct" a log, they can be much more readily penalized by their employers for violations.

The temporal shift also enables putative harassment of drivers by employers. Even when drivers are off-duty, employers can see where they are, and can contact them using systems' communication functions—which sometimes lack a "mute" function for drivers to silence employer attempts at communication, even during sleep breaks. One driver reported that other drivers in his fleet took technical steps like removing fuses to prevent being contacted during off-duty hours, but that this was a risky, fireable offense (see Chapter 6 for detailed discussion of such practices). If, for example, a driver has not left a rest stop as soon as it becomes legal for him to do so, a dispatcher may call and pressure the driver as to why he is not on the road yet (as in the "Weather Channel" exchange discussed in the previous section, in which the dispatcher sent repeated pleas to a sleeping driver to "roll" at one-minute intervals). In one industry survey, sixty-eight percent of drivers reported being told by firms to drive longer, and twenty-nine percent reported being awakened to be given these instructions (Jones 2012).

Information and dynamics of sociotechnical control

The three-dimensional shift in organizational information flows facilitates two disparate effects, which operate together to enact corporate control over drivers. The first effect involves the abstraction of truckers' labor from its local and biophysical contexts, and its translation into disunited, disembodied metrics. The second involves the resocialization of this information via its strategic deployment into truckers' relationships with their coworkers and families.

Abstraction

Fleet management systems restructure organizational information flows by reconstituting truckers' embodied work as a set of divisible, rationalized data points, presented in an apparently neutral format. These data are divorced from the context of road conditions, the contingencies of weather and shippers' schedules, and other individuated circumstances. This abstraction has two effects on drivers' occupational power: in addition to facilitating quantitative performance evaluation when such data are recombined as driver scorecards, electronic monitoring also gives dispatchers an evidentiary basis on which to challenge drivers' assessments of local and biophysical conditions. As described, a dispatcher can consider a trucker's declaration that a road is impassable *in the context of what he now knows* about how other drivers are performing under the same conditions, or can consult a driver's historic hours-of-service records or fuel-usage scores in appraising the reliability of his statements about extenuating circumstances that lead to a violation of safety regulations or company policy. The provision of additional contextual information via the electronic system equips the company dispatcher to manage his or her workforce and evaluate employee performance with less dependence on a driver's claims about conditions that the dispatcher cannot directly observe.

Many drivers read this use of data as confrontational and evincing a lack of trust. As one driver put it: "If you can't trust me to go out there and be safe and honest, then take me out of the game and put somebody in there that you think can. Either that or put a robot in the truck!" Others feel that managerial reliance on abstracted data is utterly incompatible with their highly contingent, unpredictable work:

Q: *So, what is it that you don't like about the [electronic monitor]?*
A: There are things that happen in the life of trucking that can't be overcome.

Q: *Like what?*
A: Accidents on the road, breakdowns, flat tires—anything that will slow you up. From Point A to Point B it's, say, 200 miles. You've got 4 hours to get there. That's 50 miles an hour, that's a good average for a truck. If anything happens between that—a wreck, anything where you're just sitting in the middle of the road wasting your goddamn time—excuse me, your time—you can't make that. And then they want to know why not.
Q: *Who's "they?" The company?*
A: Yeah. And the customer especially. Well, I've been driving—like I said, I've been driving truck 42 years. I'm not in the habit of explaining myself. Having me to explain myself is really an insult.
Q: *So, how does the computer affect that?*
A: Well, if I've got to sit there for 45 minutes or an hour, I'm down to 3 hours delivery time. It don't give a damn if I'm sitting there in a wreck.
Q: *The computer, you mean?*
A: No, it don't know nothing about that.

This sense extends from local to biophysical conditions as well, as another driver put it: "[Y]ou, as a professional, you know when your body is tired. You know when your mind is fatigued. You know when you need to stop and rest. That dispatcher doesn't know. And by God, that electronic device certainly does not know."

Resocialization

Another sociotechnical pathway toward organizational control of truckers is firms' deployment of electronically-derived data into truckers' social lives, both within and outside of the fleet, in an effort to foster social pressure toward conformity with organizational goals.

It is worth noting that it is not at all unprecedented for truckers to share information within their professional community. Drivers frequently share information among themselves on CB radios, on online forums, in informal conversations at truck stops, and in other venues. These exchanges build community and social solidarity among drivers, support their occupational

identities, and encourage the formation of professional pride. The kinds of knowledge drivers share sometimes include advice about how to circumvent rules effectively (for example, in order to help other drivers avoid open weigh stations and the inspections that occur there, drivers will commonly radio to one another that "the chicken coop is clean").

Unlike these other technologically assisted knowledge-sharing activities, fleet management systems enable information about truckers' activities to be shared without their direct agency or consent in order to create competition among workers. Many fleet managers post or distribute rankings based on drivers' "scorecards," which the systems make technically very easy to produce. Scorecards display driver safety records, hours of service, or other performance indicators that align with organizational goals; fuel efficiency is a very popular metric, given the high present price of fuel and its significant impact on trucking companies' financial bottom lines. The ability to easily aggregate, specify, parse, and compare this data across multiple drivers is one of the chief advantages of such systems, particularly for larger companies.

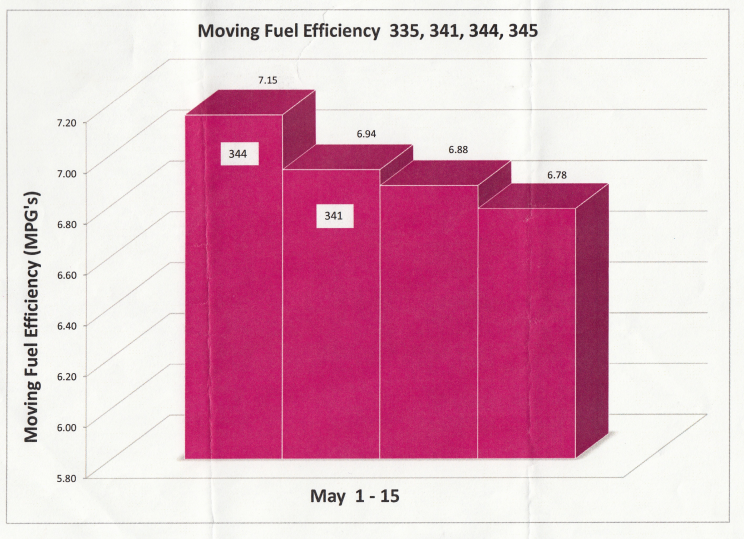


Figure 4.4. A driver analytics comparison chart, which was posted in a trucking company common area at one of my fieldwork sites. This chart uses drivers' identification numbers rather than names, and compares their fuel efficiency.

By posting performance data where drivers can see it, companies create social pressure for comparatively underperforming drivers to improve and compete (Mello and Hunt 2009). A system trainer (who advises firms about how to adopt and use fleet management systems) described to me how such displays are utilized to motivate the least efficient drivers in a fleet:

> [Companies] just put the list up and it would say, Driver A, his MPGs are 8.3, and Driver B is 8.2, and Driver C is 7.6, and Driver D is 6.2. And you post it up. Well, if you do that, what is it going to tell you? I don't want to be the one at the bottom, and next week the butt of the jokes. So I [the company] might not even say it, I just show it. And now that guy tries to do a little bit better. […] So it all depends on how you want to incentivize your drivers […] some of it is just posting it up on the wall and letting them look at it.

This strategy, then, depends on drivers feeling interpersonally shamed by their coworkers ("the butt of jokes") as a result of inefficient performance. Many firms go further by directly tying small financial incentives to the rankings produced by fleet management systems. These incentives often cost firms very little, but coupled with the pride (or embarrassment) of one's comparative ranking, were considered effective tools for aligning the goals of firms and employees:

> [You're] a fuel company, let's say, and you want your drivers to improve. And if they get a score of let's say 90 or above, you give them a 25-dollar gas card from your company. Well, not only are you giving them 25 bucks, they think it's great, but it's not costing you 25 because they're buying your gas! [...] We had customers that did that all the time. And it wasn't just gas, but other things, because we had customers that did food […] and the drivers could go eat at the restaurants that they service … so it's not really costing you 25 bucks. It is, but it isn't. And drivers appreciate it and they start to do things a little bit better. You know, and it doesn't have to be a lot anyway. So that's why a lot of people do it that way.

These incentive alignments, though often substantively small for companies, can provide powerful symbolic motivations for efficient employee performance. Incentivizing employees through intra-workforce competition is not new (Burawoy 1979); yet, the degree to which these programs comprise a fundamental element of the sociotechnical system is striking. Technical trainers (who work for the technology vendor) counsel trucking firms on how to integrate such schemes into their use of the technology, often under the rationale of "culture change," just as they provide advice on the technical workings of the FMS. Marketing materials and vendor-issued whitepapers stress the importance of rolling out incentive programs along with the installation of the systems, advising managers that "[b]arriers to adopting telematics solutions are usually about how people accept change. … It is possible to drive improved business results using people's natural inclination to be competitive."

Firms' efforts to resocialize electronically-derived data do not end within the company. Firms also invoke social pressures in drivers' own *non*-trucking communities as well, particularly among their families. Incentives like awards ceremonies and banquets, to which drivers' families are invited, are common strategies. But involvement can be even more directed, as well: for instance, one firm sends small bonus checks for the highest-performing drivers (as determined by driver scorecard data) to the drivers' *wives*, in the wives' names. The idea behind the program is that wives come to expect the checks periodically (as "a profit-sharing arrangement," as it was described to me, in recognition of a wife's familial support of her trucker husband); wives are expected to create pressure for their husbands to continue meeting the company's organizational performance benchmarks.[3] Recalling the strong "family man"

[3] By embroiling families in these managerial control regimes, monitoring-related incentive programs bear some resemblance to the involvement of wives and girlfriends as supports for state-based surveillance systems detailed in Goffman (2014).

mentality many truckers exhibit, it is unsurprising that firms' control techniques capitalize on this normative orientation toward economic provision for one's family.

Conclusion

Electronic monitoring practices are simultaneously embedded in a range of complex contexts. They serve legal and organizational aims; they centralize and redistribute operational information; they isolate data from surrounding circumstances while creating new referential frames.

The truckers' case builds on previous research in demonstrating the difficulties that can emerge when highly rationalized information systems confront local imperatives in distributed work settings (Rolland and Monteiro 2002). But the case also demonstrates that rationalization can be an incomplete explanation of the *mechanisms* through which information systems reconfigure organizational information flows. Fleet management systems, as used in trucking firms, provide multiple and surprising pathways toward managerial control over workers. The systems provide "hard" evidence, in the form of aggregated referential information, that forms a basis for challenging drivers' accounts of local and biophysical conditions. In addition, these abstracted data serve as criteria for the evaluation of truckers' performance with respect to one another, in terms of newly quantifiable metrics (Townley 1993). This strategy is given extra "teeth" when such data are strategically reembedded in truckers' social networks of coworkers and families to compel compliance with organizational objectives.

Each of these strategies depends on rendering drivers' work processes—previously self-contained and immune from immediate oversight, by virtue of their spatial circulation—newly

visible (Zuboff 1988). Truckers have long depended on their mobile invisibility to retain a degree of autonomy unmatched in other blue-collar jobs. But this seems certain to change in an era of spatially distributed organizational surveillance. By illustrating the specific mechanisms through which monitoring can engender managerial control, the trucking case reveals new pathways to the entrenchment of power in modern organizations.

Chapter 5. Computers in the Coop: Discretion, Performance, and Expertise in Law Enforcement Interactions

Law enforcement efforts increasingly, and controversially, rely on digital monitoring technologies for the accomplishment of enforcement tasks. Some of these efforts are (now) well-known, much-publicized, and have attracted significant intellectual and public debate (for instance, the National Security Agency's mass collection of American citizens' communications metadata; the use of warrantless GPS tracking of a suspect vehicle, recently deemed unconstitutional by the Supreme Court in *U.S. vs. Jones*). Other usages—like reliance on closed-circuit television systems, license plate readers, red-light cameras, and the like—have excited less public response, in part because some such technologies are commonplace and their use routinized, while others are nascent and the public has yet to become broadly aware of them.

But as the sociology of technology has well established, technical systems remain shot through with social influence (Nissenbaum 2001; Pinch and Bijker 1984; Winner 1980). Discretion and bias enter technological artifacts at all stages, from design to use to reappropriation. Though digital enforcement systems may render human law enforcement officers less visible or change their enforcement roles, humans remain central to enforcement efforts. To date, relatively little sociological work has investigated how human and digital rule enforcers work together (but see Norris and Armstrong 1999; Shklovski et al. 2009; Troshynski, Lee, and Dourish 2008). How do enforcement practices change when human and machine collaborate? How do technological enforcement regimes empower or disempower human actors?

In this chapter, I investigate these dynamics in the context of EOBRs and commercial vehicle inspectors' interactions with truck drivers. I find that human/machine hybridity creates unanticipated challenges to enforcement and changes how power is negotiated between officers and truckers.

I focus on three dynamics, relating to *discretion*, *performed expertise*, and *alliance*. To avoid inspection, truckers strategically signal their compliance with time limits to officers through truckside decals that declare electronic equipment to be in use, potentially obfuscating their actual non-compliance with the underlying law—a maneuver that exploits inspectors' discretion regarding whom to inspect. When inspections occur, officers often have difficulty acquiring the data from the monitors, and these technical troubles are overtly visible to drivers. Officers depend on drivers for help in retrieving data for inspection, potentially undermining their perceived authority. In so doing, drivers and inspectors—traditionally in an oppositional relationship vis-à-vis the inspection process—may instead become aligned against a technological "common enemy" of the monitor.

Together, these dynamics work to destabilize traditional power relations in police interactions with truckers, as the surveillance technology makes officers more dependent on drivers and more interactionally vulnerable. The case demonstrates that, despite the conventional notion that surveillance technologies reinforce traditional authority relations, in some cases their presence may counterintuitively rearrange such relations.

The log inspection process

Because both paper logs and electronic logs are legal methods of trucker timekeeping, law enforcement officers responsible for commercial vehicle and driver inspection must be adept at reading both types. Even when EOBRs are used, their readouts are read manually by human inspectors. During a log inspection, the officer reviews the driver's logs to ensure that he has not driven more than he is legally permitted to in the past seven days. Because log falsification is rampant, the officer pays particular attention to the logic of the logs to see if the travel recorded by the driver is sensible—for instance, could a driver realistically have moved from city A to city B in the number of hours denoted on the log? He uses a driver's "supporting documents" (bills of lading, receipts for fuel and tolls, etc.) to confirm locations and times when possible.

The inspector also ensures that the "form and manner" of recordkeeping complies with federal regulations; that is, that records are properly kept, signed in required places, that locations where duty status changes occur are noted, and the like. Should any aspects of a driver's log (paper or electronic) fail to meet legally required standards, the officer is required to note the violations on an inspection report. For some violations, the officer can also issue a citation—which is usually accompanied by a fine of hundreds to thousands of dollars, depending on the violation, and/or an "out of service" period of two to ten hours, during which the driver may not move the vehicle away from the inspection site. (The logic is that a tired driver should use this out-of-service time to sleep in the sleeper berth of the truck cab.)

It would be logistically impossible for officers to inspect the logs of all trucks who pull into a weigh station. All drivers are required to pull through a weigh station if it is open (usually

denoted by a sign or flashing light on the highway); following that, importantly, the inspector has broad discretion as to which trucks to wave through and which to inspect.

How monitoring technologies mediate power between officers and truckers

Digital monitoring technologies reconfigure traditional power dynamics between human enforcers (law enforcement officers inspecting commercial vehicles) and enforcees (truck drivers). I focus on two key stages of the interaction. First, I consider the interplay between digital enforcement and discretion that arises before an inspection occurs, when an officer is determining which trucks to pull in for inspection, and how truckers make use of strategic signaling to evade checks. Second, I investigate the interplay between digital enforcement and the performance of expertise by considering how the microinteraction between driver and officer changes when electronic logs are in use during an inspection, as well as how this process can result in a shift from an adversarial relationship toward one of mutual alliance against the technology.

Before inspection: strategic signaling and decoy compliance

Electronic logbooks challenge long-held practices in the law enforcement community. Law enforcement officers are used to reading paper logs, which for decades have had a standardized "grid graph" display. Officers have standard protocols for inspecting these logs, involving the order in which they ask questions, the supplemental tools they use during inspection (like mapping software on their own laptop computers to confirm distances between

cities) and the methods they use for interrogating drivers about their logs. The grid graph can be difficult to read for inexperienced eyes, but over time, officers develop an 'eye' for the system and can spot many inconsistencies and violations (at least, those that are visible on the face of the log; as noted, paper logs are readily falsifiable).

Electronic logs can be much more difficult for inspectors to negotiate for a number of reasons (some of which I address in more depth in the subsequent section). But a key issue is that the interfaces electronic logs display for inspection are not standardized. Dozens of EOBR models are currently on the market. Some EOBRs display information in a traditional grid graph format; others list duty changes chronologically, as a list. Some summarize information like a driver's weekly and daily countdown clock on a separate screen. Some change the color of certain data to red when the driver is in violation of the time limits (or in danger of having a violation soon); others do not. Some list time elapsed, rather than time remaining, on a given clock. All the interfaces work differently—different elements are clickable; some require the use of a stylus; others render no electronic display at all, but must be printed (some have printers attached). All of these variations make EOBRs much more difficult for law enforcement to negotiate, and thus unpopular with a number of law enforcement officers. Several law enforcement officers told me that they are not confident inspecting electronic logs for this reason or that they are "spooked" by them. (In time, as federal rules are likely to mandate EOBR use for all truckers, these inconsistencies will resolve, as the rules will very likely list technical specifications that must be consistent under the law. But for now, the diversity of electronic log displays persists as a difficulty for law enforcement officers.)

Truck drivers are aware of many officers' reluctance to negotiate electronic logs, and several drivers stated to me that they were less likely to be inspected when they were using

electronic logs.[1] In some cases, drivers reported being pulled into a bay for inspection and then waived through when the officer saw an EOBR (as one driver put it: "But I've had people like at the coop,[2] the scale house or whatever, where I've pulled in and they ask for my logs and I tell them I've got a Qualcomm and they tell me just to leave."). But in others, drivers reported that they could avoid being pulled in *altogether* by indicating to inspectors that electronic logs were in use in their truck.

A common way to do this is by *strategically signaling* compliance with the timekeeping rules via a truckside decal indicating that an EOBR is in use. These decals typically come with EOBRs when they are purchased from the vendors (much as a home security system comes with a yard sign or window cling) and state that an electronic monitoring system is in use in the vehicle. A selection of such decals, photographed in the course of my fieldwork, is pictured in Figure 5.1.

[1] An additional, alternative explanation for inspectors' reluctance to pull in drivers using electronic logs is that drivers running electronic logs are (at least anecdotally) less likely to have violations—in part because electronic logs are more difficult to falsify, and in part because the carriers currently using EOBRs now (before the federal mandate) tend to be large, safety-conscious companies, rather than small fly-by-night carriers that are more likely to pose serious safety threats. In practice, both dynamics are probably at work; there are thousands of commercial vehicle inspection officers, and their practices vary widely. By no means do I imply that all (or even most) officers have difficulty reading electronic logs; yet, this difficulty came up repeatedly in my fieldwork and interviews.

[2] As I have described earlier, the "coop" (short for "chicken coop") is common trucker parlance for an inspection station or scale house where law enforcement officers are. The phrase derives from another term in the trucker vernacular: referring to inspection officers as "chicken shit."



Figure 5.1. Electronic log truckside decals.

However, because the presence of decals may avert inspection by law enforcement officers thanks to their degree of discretion as to who to inspect, some truckers and carriers have sought to *simulate* compliance with the timekeeping rules by indicating that such a system is in use—even when it is not, in fact, in use. Display of a decal without an actual electronic log system to back it up is not against federal regulations, and may allow a driver to "roll through" inspection points.

Because of this, a "black market" of sorts has arisen in which some carriers and drivers attempt to obtain decals without actually installing EOBRs. One leading EOBR vendor reported to me that, while the company distributes the decals for free, they have recently restricted the ability to request decals to an existing-customers-only website in recognition of this issue. Another company's sales representative reported that when he travels to trucking companies to pitch the EOBR system, many companies are only interested in obtaining the decals. Truckers

have also come up with other creative solutions, such as printing up their own unofficial decals using sign shops or adhesive letters, or seeking extra decals from one another on trucker message boards.[3]

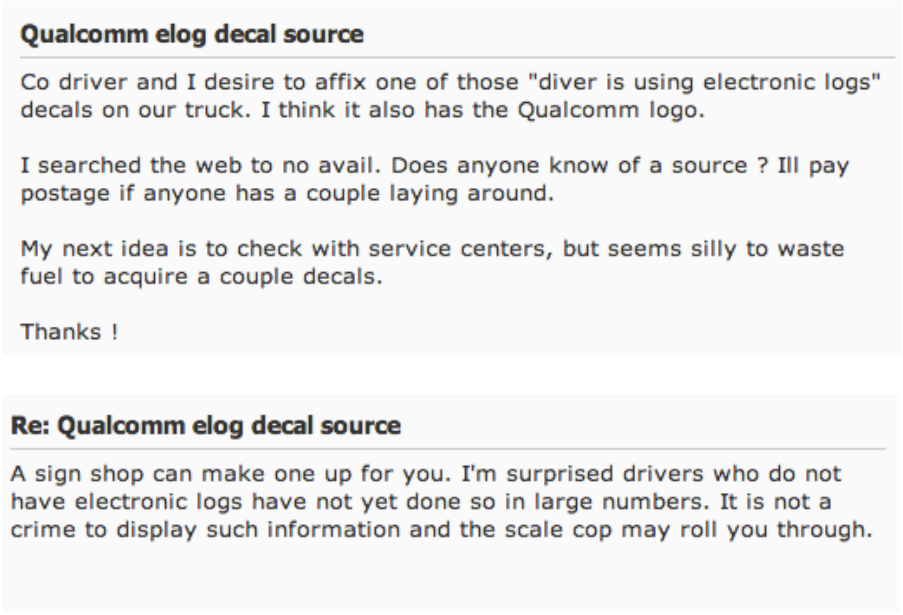


Figure 5.2. Screenshots from trucker online forums.

Such "decoy compliance" practices cleverly play digital and human law enforcement against each other. Truckers exploit human officers' discretion about who to inspect, as well as their reluctance to deal with electronic logs, in order to evade enforcement altogether—certainly not the regulatory intent, nor the dominant rhetoric, behind the introduction of the electronic monitoring scheme.

[3] This "decoy compliance" is one of many forms of truckers' resistance to electronic monitoring, which I discuss systematically in Chapter 6.

During inspection: authority as embodied performance

Of course, inspections involving electronic logs still do occur regularly: some inspectors pay no attention to truckside decals, some trucks with EOBRs lack decals, and some inspections occur for other reasons (for instance, many inspectors will pull a truck in if it has visible non-log-related violations, like load securement issues, visibly faulty tires, lack of required permits displayed, etc.). Thus, I next consider how the inspection process differs when electronic versus paper logs are in use.

When an officer inspects a paper log, he or she typically approaches the truck's driver's cab, requests that the driver pass the logbook down from the open window or door, asks the driver for additional documentation that is part of the inspection process (load paperwork, permits, a medical inspection card), and then departs for his or her own vehicle for thorough inspection of the drivers' paperwork and logs. The officer's vehicle, parked nearby, is a workstation: it contains the officer's laptop, printer, and other equipment of which the officer makes use in conducting the inspection. Like a police officer pulling over a motor vehicle driver at roadside, a commercial vehicle inspector runs the truck driver's paperwork against a number of electronic databases, state and federal, to check the driver's record, see if the truck is stolen, ensure the carrier has operating authority in the state, and other functions. The officer can also peruse the drivers' logs in great detail in his or her vehicle: he or she can spread out supporting documents (like bills of lading and receipts) to correlate them with stops detailed on the paper log, can compare a driver's reported mileage against software that estimates mileages between cities, and can use a calculator to add up the multiple rows of numbers that must be checked to ensure the driver's compliance with all aspects of the hours-of-service rules.

Such a process can commonly take as long as thirty or forty minutes, and in extenuating circumstances as long as two hours (based on my own observations and reports from law enforcement personnel and truck drivers). During this time, the driver is typically sitting and waiting in his truck cab, unable to depart until the officer finishes the inspection. Officers do not appear to feel any pressure to hurry this segment of the inspection; the process is time-intensive, but the time an officer makes a driver wait is an enactment of his authority over the driver. Making the driver wait is the officer's prerogative. And because the work is detail-oriented, it cannot be rushed.

The physical separation of driver from log also facilitates interrogation over the log's contents. An officer will often ask the driver to pass down his log, and will only *then* ask questions of the driver ("where did you start this morning?" "what time did you finish driving last night?") that are intended to assess the veracity of the entries on the log.

The process differs entirely when the officer is inspecting electronic logs. First, because of the variety of interfaces described in the previous section, officers often have significant difficulty acquiring time data from the monitors. Because the data are presented in a wide variety of formats, officers generally lack fluency with all the possible systems with which they might be presented. Foreseeing this difficulty, the federal regulations pertaining to EOBRs require drivers who use electronic logs to carry an instruction card that must be tendered to the officer detailing how data can be retrieved from the EOBR (49 C.F.R. §395.16(l)(1)); though failure to carry such an instruction sheet is an inspection violation, many drivers lack the card, or confuse it with other documentation related to the EOBR provided to them by their carrier. Even when such a card is provided, an officer's reliance on it makes abundantly clear to the driver that the officer lacks

inherent knowledge about how to operate the equipment, which greatly undermines the officer's authority.

Physical separation is typically not an option when electronic logs are in use.[4] Because electronic monitors are hard-wired into the trucks, they cannot be separated and taken back to the officer's vehicle for close, isolated inspection. Some models are equipped with cables that allow the monitor to be stretched out the truck window, meaning that the officer must stand outside the cab on the ground, possibly in inclement weather, and below the (seated) driver, to complete his log inspection. But most models lack a cable and must be inspected on the dashboard where they are attached. This means that the officer must enter the truck's cab and complete the inspection there, often sitting in the driver's seat of the truck, with the truck driver standing behind him, quite literally looking over his shoulder as he pokes at the EOBR screen. Truck cabs are not large spaces, and they are operatively the truckers' homes when they are on the road. They may be quite dirty or crowded with personal belongings. Many truckers bring dogs with them on the road, which may be resident in the cab during the inspection. And, of course, entering this small, unfamiliar, intimate space requires the officer to attenuate his attention from the EOBR in order to keep an eye out for his personal safety (for instance, as one officer reported to me, he is careful to position one elbow over his firearm holster while seated in the cab during an EOBR inspection, and does his best to survey the cab upon entry and continually for weapons or contraband).

[4] In some cases, physical separation can occur. Some EOBR technologies allow data to be emailed or printed directly from the module. In other cases, the carrier's home office—which typically has access to the driver's logs in real time—may send data, upon request, to the police officer for inspection. Resort to these data transfer methods—some of which are decidedly low-tech, like faxing logs from the home office to the inspection station—are dependent on a number of factors: not all officers accept such transmissions as valid (according to the letter of the regulation, the driver must be able to produce the logs); an officer's own technological systems must be operating well (which they are often not); and officers who accept these logs must still confirm that the log that has been transmitted is, in fact, the driver's actual time record.

Thus, when electronic logs are inspected, inspections are more difficult for officers to complete thoroughly, due to a multitude of technical and microinteractional factors. This means that logs are inspected less carefully and that inspections take much less time (often five to ten minutes). Of course, this difference could be interpreted as electronic logs having precisely the effect they are designed to: there is no reason for officers to complete time-consuming, extensive interrogations of hours-of-service records if the electronic system essentially assumes this burden for them. But attention to the microinteraction between enforcer and enforcee suggests that this difference occurs not because electronic logs are inherently more accurate than paper logs, but because they are more technically difficult and socially uncomfortable for officers to interrogate.

Adversarialism vs. alliance and the digital common enemy

When inspections of electronic logs do occur, the microinteraction between enforcer and enforcee can shift from being an adversarial one, aimed at uncovering inconsistencies in accounts and probing the trucker's veracity, to being reluctantly collaborative. The officer depends on the driver for help in retrieving data for inspection; as described, this dependence is even formally inscribed in the law, since an instruction card must be tendered by the driver. Any difficulties or incompetencies the officer displays in dealing with the EOBR occur in full view of the driver, who (often quite literally) looms over the shoulder of the officer.

In some cases, the oppositional relationship morphs into one of new alignment again the technology, which is the new central point of focus in the interaction. Often, a driver will lack or disclaim knowledge about the workings of the EOBR, saying something like "oh, the company made us put these in"; as described, many drivers dislike the EOBRs because they remove

flexibility and a sense of autonomy from their daily work. Because most drivers did not choose to install the monitor and are not direct creators of the time entries it displays (as compared to the pencil markings created by the driver on a paper log), it is easier for the driver to disclaim responsibility for the data the EOBR renders, and to be at least partly absolved of it ("I don't know why it says city A, I was in city B"); after all, who among us has not had our efforts thwarted by technology on occasion? In some cases, inspectors respond with commiseration—sometimes subtly, via a shake of the head or a meaningful sigh—or by calling attention to the poor design of the systems. In other cases, inspectors unable to parse EOBR data redirected their enforcement attentions to more cut-and-dry requirements, like the presence or absence of the inspection card, instead of attempting to closely read the electronic data.

The EOBR thus can serve as almost a third party in the enforcement interaction: a convenient common enemy for the driver and the officer, against which they may be temporarily united in frustration and lack of understanding. In this way, the technology can occasion momentary solidarity, transforming an adversarial relationship into a temporary aligned one, as it provides an avenue through which the inspector can save face (Goffman 1959) and regain authority that he or she may have lost due to lack of demonstrated expertise with the technology.

Discussion: surveillance, performance, and the destabilization of power

Commercial vehicle enforcement officers often have difficulty acquiring data from the electronic monitors, and these technical troubles are overtly visible to drivers. The difference between microinteractional dynamics in paper-based versus electronic inspections underlines the embodied nature of power and authority in the enforcer-enforcee relation. When a paper log is

used, time and distance are sources of authority for officers, who strategically separate the driver from his log, peruse the logs carefully in their own spaces with their own tools, and make drivers wait as long as the process requires. When electronic logs are used, officers cannot draw upon these resources; their authority and expertise are on the line as they attempt to complete their duties in full view of drivers. The following table summarizes key differences between the two enforcement technologies.

	Paper log	**Electronic log**
Time	A source of authority	A source of anxiety/sign of incompetence
Distance	Makes careful, self-paced inspection possible; a resource for ensuring veracity (separation of driver from log before asking questions)	Fixed nature of monitor makes careful, self-paced inspection impossible; creates safety risk to officer, attenuates attention, makes incompetence visible
Officer's expertise (or lack thereof)	Invisible; assumed	Visible; contested
Relationship between enforcer and enforcee	Oppositional; questions asked to probe veracity, try to catch internal inconsistencies in trucker's reports	(Reluctantly) collaborative; questions asked to help officer navigate technology; officer is reliant on driver's help; some alignment based on technical "common enemy"

Table 5.1. Key differences between paper and electronic logs for the inspection interaction.

This difference leads to microinteractional dynamics not captured in the common rhetoric of technology as an enforcement perfector. Carriers and drivers exploit officers' perceived reluctance to deal with electronic monitoring systems (whether as a result of officers' lack of expertise or their assumption of legality) by signaling compliance using truckside decals. This practice of "decoy compliance" underscores the central role of discretion in the enforcement regime, despite the assumption that digital enforcement minimizes discretion. When inspections

of electronic systems do occur, the traditional power relation is destabilized as the officer's authority is undermined and new vulnerabilities are created, due to the visibility of the inspector's (lack of) expertise; in order to 'fix' this encounter, officers and truckers may align temporarily against it.

As highlighted by Shklovski et al. (2009), digital monitoring systems discipline and regulate law enforcement officers as well as the ostensible targets of the monitoring. In their study of how GPS anklets change parole officers' work supervising parolees—parole officers spent significant energy trying to make sense of the GPS data traces and the spatiotemporal contexts in which they were produced; locational data, as recorded by the monitors, became a stand-in for parolees' behavior, and officers devoted substantial resources to understanding what these traces denoted by doing "legwork" to contextualize them—resources that they could not devote to other "thick" forms of enforcement, like in-person communication.

Commercial vehicle inspectors, too, are disciplined by the enforcement technologies with which they are tasked to work. The labor of sensemaking in the inspection process is far from trivial. The regulations to be enforced are dense and complicated; officers must simultaneously look for *prima facie* rule violations, corroborate multiple sources of evidence to root out inconsistencies and likely falsehoods, remain vigilant about their own safety, and keep alert for signs of more serious wrongdoing, like human or contraband trafficking (see footnote 5). When an inspector's cultivated routines for conducting this sensemaking work are disrupted by new technologies—putting his newfound unskillfulness on full visual display in front of the person over whom he is assumed to have authority—the officer may lean on his inherent discretion, to avoid the encounter altogether; or, he may conduct his work in a much more cursory way, or by taking steps to "fix" the encounter through commiseration with the driver.

The conventional way of thinking about surveillance technologies is that they reinforce traditional authority relations: states and other powerful actors use them to reassert and deepen their authority over surveilled subjects. The case of the EOBR complicates this understanding by suggesting that the microinteractional practices around these technologies matter, and in some cases can rearrange observer/observee relations in ways that counterintuitively *de*stabilize power. The case functions as a reminder that even technologically augmented enforcement systems are shot through with human influence, bias, motivation, and discretion—whether in their design, adoption, routine use, processes of appeal, or through many other possible avenues (Citron 2008; Friedman and Nissenbaum 1996; Nissenbaum 2001; Norris and Armstrong 1999; Shklovski et al. 2009).

One additional point is noteworthy, regarding how technical change in the EOBR system over time will impact (and be impacted by) the microinteractional dynamics of inspection. It is likely that the specific problems I have identified will largely be resolved by regulatory and technical processes in the near future. Pending EOBR regulations will very likely standardize the interface specifications required for a device to be legally compliant; officers will learn to interact with the new systems as they become mandatory; and wireless data transmission protocols are also being explored, obviating the need for an inspector to physically get into the truck.[5]

[5] In the short term, EOBRs are likely to remain human-inspected, in significant part because truck inspection processes typically also involve visual inspection of issues like how well a load is secured, whether tire treads are deep enough, and other safety issues that are currently hard to translate into electronic data. However, the Department of Transportation has engaged in some pilot projects that would detect hours-of-service violations via an in-road transponder, similar to EZ-Pass Express lanes in which wireless signals transmit data without a car needing to pull over or slow down significantly. Interestingly, law enforcement officers I spoke to have significant trepidation about increasing automation in these systems. Informants told me that many significant trafficking busts (human and drug-related) occur when an officer detects "something hinky" in the course of a routine inspection, possibly as subtle as a trucker appearing unduly

Despite the fact that the specific nature of the issues is likely to change, examining the enforcement apparatus at the moment of transition is worthwhile (Bailey et al. 2012; Barley 1986). It illuminates the entrenched ways in which power and authority are enacted through enforcement microinteractions in a way that would be difficult to assess if the system status quo were not in an unsettled, transitional state. And even when EOBR interfaces become standardized and/or officers become proficient at interacting with them, the present study suggests that discretion, performance, and interactional dynamics will remain important factors to consider in assessing the workings of the enforcement regime, regardless of its technical specifications.

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nervous or physically sweating during an inspection. Officers worry that if they do not have regular opportunities for close interaction with truckers, they will miss these signals.

Chapter 6. Beating the Box: Resistance to Surveillance

The EOBR is intended to compel legal compliance by quashing truckers' long-held ability to "fudge" paper recordkeeping. As I have explained, noncompliance of this sort is culturally encouraged, economically incentivized, and technically easy; it involves only paper, pencil, and (if asked to explain oneself) the ability to justify this non-verifiable account with a straight face. But as EOBRs pervade the industry, noncompliance strategies evolve as well, particularly in light of widespread ideologically- and pragmatically-motivated resistance to electronic monitoring among truckers, firms, and other key players. In this chapter, I explore the resistance schemes provoked by electronic monitoring in trucking.

The truckers' case speaks to resistance as a sociolegal phenomenon more generally. Empirically, we know relatively little about how people resist (perceived or actual) invasions of their privacy, and we lack developed theoretical frameworks to help us understand how and why resistance occurs. But resistance is fast becoming an important focus for sociolegal attention, as surveillance becomes more pervasive, wholesale opt-out becomes less feasible, and circumvention strategies are criminalized. This chapter takes a grounded approach to developing new theoretical and empirical knowledge about resistance to surveillance *in vivo*. I discover a wide range of resistance practices truckers and associated parties use to foil regulatory and organizational surveillance of their work behaviors—ranging from material interventions (e.g., smashing monitoring devices with a hammer), to creative data manipulations, to collaborative evasion tactics that enlist seemingly disinterested third parties like gas stations. These strategies reveal a variety of motivations for resistance, shed light on the shortcomings of digital law enforcement, and contribute to our theoretical understanding of resistance to surveillance.

Theorizing resistance to surveillance

As surveillance continues to infiltrate daily life at multiple scales and domains, the issue of resistance becomes paramount. What types of things do people do to thwart privacy invasions, and why? Can we develop a theory of resistance that might inform our privacy laws and policies in fruitful ways?

Resistance to surveillance is difficult to study empirically, for several reasons. First, resistance is situationally specific, and often (though not always) geographically or temporally diffuse. In some cases, resistance strategies are deliberately unconcealed, but in many others, they are undertaken in secret in order to avoid detection by surveillors.

Perhaps because of these challenges, we lack comprehensive, empirically-derived theories for understanding resistance to surveillance. But as surveillant regimes continue to proliferate across multiple domains of daily life—not only from state actors, but from non-state institutions in health care and education, employment settings, and interpersonal contexts—the time is ripe for law and privacy scholars to take resistance seriously. Monitoring continues to emerge as the dominant paradigm for institutional regulation; as surveillance increases in scope and type, we might expect to see resistance activity increase concomitantly.[1] As surveillant institutions become more entwined and pervasive (Haggerty and Ericson 2000), wholesale opt-

[1] Whether resistance indeed increases as surveillance increases is an empirical question; we might find, instead, that resistant activity "levels out" in the aggregate as surveillant regimes become normalized over time. Alternatively, surveillance and resistance may together drive innovation that improves surveillant technologies over time, given the fact that, as resistors figure out ways to circumvent surveillance, surveillors are driven to thwart such efforts through more secure and sophisticated systems. Compare Kerr's (2010:257) analysis of innovation in mechanical and digital locks, driven largely by an "ever-escalating arms race between lock-makers and lock-breakers."

out becomes less tenable as a strategy for avoiding surveillance, creating a space for new and creative strategies that challenge, obfuscate, and thwart data collection (Brunton and Nissenbaum 2011).

In addition, resistance is ripe for legal attention as legal measures that criminalize resistance strategies emerge (Galetta 2014). The most prominent example is the anti-circumvention provision of the Digital Millennium Copyright Act (DMCA), which forbids a person from "circumvent[ing] a technological measure that … controls access to" certain intellectual property (17 U.S.C. § 1201(a)(1)) by descrambling, decrypting, or otherwise "avoid[ing], bypass[ing], remov[ing], deactivat[ing], or impair[ing]" the technology (17 U.S.C. § 1201(a)(3)(A)). Anti-circumvention laws effectively buttress technological control regimes with legal ones, and create novel questions about the changing meaning of property and ownership (Radin 2004).

Further, a focus on resistance re-prioritizes individual agency in sociolegal analysis, and as such, constitutes a natural subject of inquiry for legal realists and others who are interested in how law unfolds via *in vivo* practice. Much surveillance scholarship has a tendency to render individuals as merely passive data points being manipulated by top-down systems. In fact, individuals are actively engaged in surveillance regimes in many ways (Levy 2013; Marwick 2012). A focus on resistance reasserts the agency of the surveilled as more than simply a "docile body" (Foucault 1977); as Simmel (1950) reminds us, power is not merely enacted *on* a party, but is the result of an interaction among parties. Moreover, through problematizing resistance as a process of power negotiation across networks of actors—as I propose in this chapter—we develop a deeper understanding of the mechanisms, motivations, and social alignments underlying resistant practices.

Some recent and notable work suggests that sociolegal thinkers are beginning to take resistance seriously (see especially Fernandez and Huey 2009, and their special issue of *Surveillance and Society*). I use this work as a jumping-off point for my investigation. Perhaps the most systematic effort to date is Marx's "A Tack in the Shoe" (2003), which catalogues eleven breeds of general resistance practice (e.g., avoidance moves, distorting moves, switching moves). Brunton and Nissenbaum (2011) develop the idea of obfuscation as resistance practice—the practice of producing false or ambiguous data to confuse a surveillor or make surveillant practices more costly. Other scholars suggest that *sousveillance*—inverse surveillance, or "watching the watchers"—can be an effective countermeasure (Mann, Nolan, and Wellman 2003).

Monahan (2006), in his empirical survey of technical and social surveillance counterstrategies aimed at urban closed-circuit television surveillance systems, identifies a range of practices—from destruction to evasion to artistic protest—but suggests that these tactics largely fail to challenge deeply embedded institutional basis of surveillance in lasting ways. Monahan's study informs my own, though he primarily focuses on the countersurveillance efforts of politically motivated or activist groups.

Other influential studies examine strategies of political resistance; though not necessarily directed against surveillant regimes, this work provides informative background. *Weapons of the Weak* (Scott 1987), James C. Scott's brilliant study of Malaysian peasants in the 1970s, illustrates the quotidian tools of defiance engaged by the powerless against the powerful—among them foot-dragging, gossip, sabotage, and feigning ignorance (see also Gilliom 2001 for a more contemporary example). Finally, organizational sociology provides a tradition of examining workplace resistance to managerial control, though this literature generally does not concern

surveillance *per se* (e.g. Burawoy 1979; Mulholland 2004; Prasad and Prasad 2000; Thompson and van den Broek 2010)—and some scholars suggest that the concept of resistance remains undertheorized in that discipline as well (Hodson 1995).

I take a grounded theoretical approach to the study of resistance (Charmaz 2006) by focusing on resistance maneuvers in the specific context of electronic monitoring in trucking. I examine this case in depth in order to assess what theoretical contribution can be inductively assembled from it. As described in Chapter 1, I do not suggest that truckers are a representative group in terms of the types of resistance in which they engage; but empirical study of this population might help us to develop or theoretical understanding of resistance more generally.

As I have described previously in the dissertation, there is a strong cultural emphasis on freedom, machismo, and independence in the trucking workforce; truckers are often loathe to being told how to do their jobs, and often defiant or derisive in the fact of government or organizational bureaucracy. As such, they are an ideal population to study in order to learn about methods of, and motivations for, resistance to such control. Wells and Wills (2009) suggest the centrality of identity in resistance practices. Specifically, they assert that resistance to surveillance is most likely to occur when the subject presumed by the surveillant system is fundamentally incompatible with the surveilled party's self-understanding. This dynamic is acute in the truckers' case. Truckers resist surveillance to preserve their coveted privacy and independence, and to reestablish their long-held occupational autonomy. Even to the extent that drivers circumvent surveillance to make more money, that motivation is supported by a strong cultural norm toward provision for one's family; in trucking, this is part of what being a man is all about. Even the idea of being able to withstand exploitative and incredibly difficult work

conditions accords tightly with truckers' sense of professional pride. Resistance, then, is a means of asserting one's professional identity as a trucker, for better or worse.

Being electronically tracked, on the other hand, emphatically does *not* accord with truckers' professional identity. Truckers told me again and again that they found this use of data to evince a lack of trust that they found deeply insulting, and that likened them to either children or criminals. As one driver put it in a regulatory comment: "I do not want a babysitter. True professionals can regulate themselves." Another: "I am 54 years old and I probably have 10 to 15 good years left. I also have pride and I'm not going to work under conditions where I'm treated like a child."

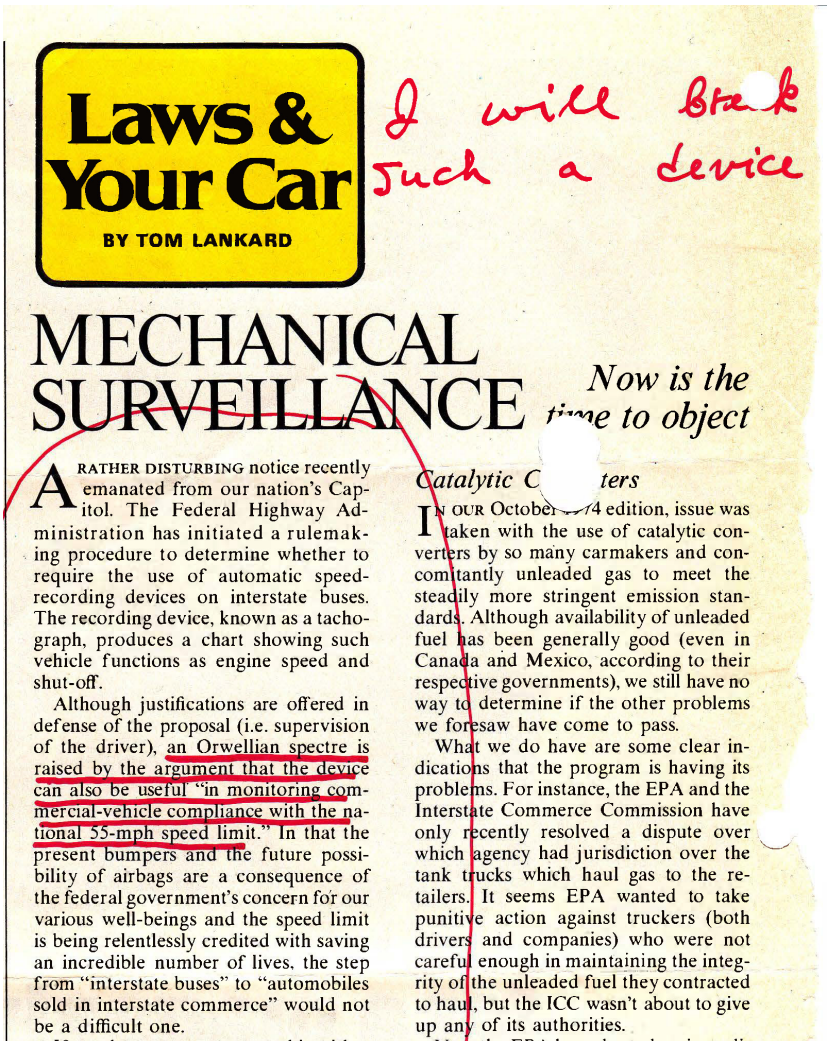
Truckers' counterstrategies

Electronic recordkeeping is appealing to policymakers because it is understood as being much more difficult to falsify electronic records than paper records. In other words, it is considered to be more *resistance-proof.* But truckers are a savvy and motivated bunch, with a deeply autonomous occupational culture, and no electronic system is completely immune. Truckers employ a panoply of resistance strategies to reassert their autonomy against electronic monitoring—ranging from physical manipulations to collusive social practices, from technical workarounds to organizational exit. In this section, I describe this range of resistant maneuvers, which I place into four general categories.

Material interventions

Brute force. Some truckers employ "brute force" methods of resistance by, quite literally, taking a hammer to the offending computer. In some cases, such destruction is an overt means of symbolic communication to a driver's (perhaps soon-to-be-former) employer, signaling in no uncertain terms his feelings about being monitored. In others, the driver takes steps to preserve the outward physical appearance of the monitor in order to destroy its capabilities more covertly. One industry association reported that drivers destroyed monitors by "covering them with a small bag of dry ice and tapping them with a rubber mallet"; doing so left "no outward sign of assault" but left the machine's "solid-state innards shattered into a billion pieces."

Occasionally, brute-force destruction can be a means of collective dissent. One former driver reported to me that *all* the drivers at his furniture-delivery firm engaged in coordinated resistance when the company installed timing equipment in all of its trucks. Upon leaving the warehouse, he reported, "the driver would wrap his jacket around the timing instrument and disable it by hitting it with a hammer. All of the drivers participated and this continued for about a week, at which time the company gave up on its timing attempts, assuming, I suppose, that the timing instruments just did not work."



Laws & Your Car

BY TOM LANKARD

I will break such a device

MECHANICAL SURVEILLANCE

Now is the time to object

A RATHER DISTURBING notice recently emanated from our nation's Capitol. The Federal Highway Administration has initiated a rulemaking procedure to determine whether to require the use of automatic speed-recording devices on interstate buses. The recording device, known as a tachograph, produces a chart showing such vehicle functions as engine speed and shut-off.

Although justifications are offered in defense of the proposal (i.e. supervision of the driver), an Orwellian spectre is raised by the argument that the device can also be useful "in monitoring commercial-vehicle compliance with the national 55-mph speed limit." In that the present bumpers and the future possibility of airbags are a consequence of the federal government's concern for our various well-beings and the speed limit is being relentlessly credited with saving an incredible number of lives, the step from "interstate buses" to "automobiles sold in interstate commerce" would not be a difficult one.

Catalytic C[illegible]ters

IN OUR October [illegible]4 edition, issue was taken with the use of catalytic converters by so many carmakers and concomitantly unleaded gas to meet the steadily more stringent emission standards. Although availability of unleaded fuel has been generally good (even in Canada and Mexico, according to their respective governments), we still have no way to determine if the other problems we foresaw have come to pass.

What we do have are some clear indications that the program is having its problems. For instance, the EPA and the Interstate Commerce Commission have only recently resolved a dispute over which agency had jurisdiction over the tank trucks which haul gas to the retailers. It seems EPA wanted to take punitive action against truckers (both drivers and companies) who were not careful enough in maintaining the integrity of the unleaded fuel they contracted to haul, but the ICC wasn't about to give up any of its authorities.

Figure 6.1. A comment submitted to the Federal Highway Administration in response to a 1975 proposal to require mechanical tachographs in some commercial vehicles: "I will break such a device." (source: National Archives, docket number MC-63-26).

Electromechanical interference. Other material strategies are more fine-grained, and depend on finding electromechanical means to disrupt the monitoring devices' recording or transmission capabilities. This breed of resistance practice has deep roots in trucking. Before EOBRs came to market, some trucking carriers in the United States installed tachographs, devices that hooked into the truck's engine and logged a driver's speed and distance driven by means of a stylus that recorded indicator marks on a wax card. Tachographs (mechanical, and

later, digital) have been legally required of truck drivers in Europe for decades; and for decades, drivers have figured out ways to cheat them.

Ross Anderson, a well-known computer security researcher, provides an excellent review of myriad methods for interfering with digital tachographs (Anderson 1998); marketing materials that instruct firms about how to detect tampering also serve as informative sources. These methods include deliberately shorting fuses or disconnecting cables; unsealing the devices so as to disrupt their internal calibration; bending or blocking styluses; or inserting an after-market interruptor (what one of my respondents told me was called "an Italian adapter") into the cable that causes recorded speed and distance to be reduced by a given proportion (e.g., 10%). These products can often be found, I was told, under the counter at truck stops.

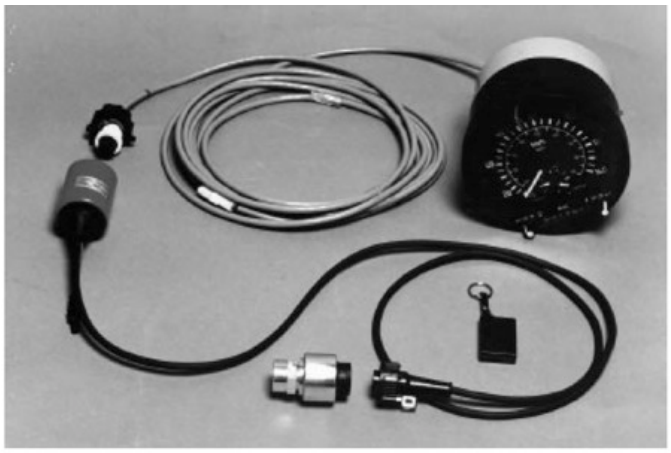


Figure 6.2. A tachograph interruptor, and a radio key fob used by the driver to control it. (source: Anderson (1998))

Drivers were also known to use common household items to "adjust" the tachograph's recording, according to one research participant (a trucking historian):

When a driver inserted the disk into the tachograph and you closed the door, there was a small knife that put a knick in the edge of the chart. … There should only be two knicks in that chart, one when you put it in and one when you take it out. So, it was pretty common for that knife to become dislodged or lost or broken. I've seen drivers that would put a rubber band on the main needle to keep it from recording as high and even to use a dime or penny as a shim. … So yeah, I don't know that there's anything that's been put out so far that somebody hasn't at least attempted to modify or bypass.

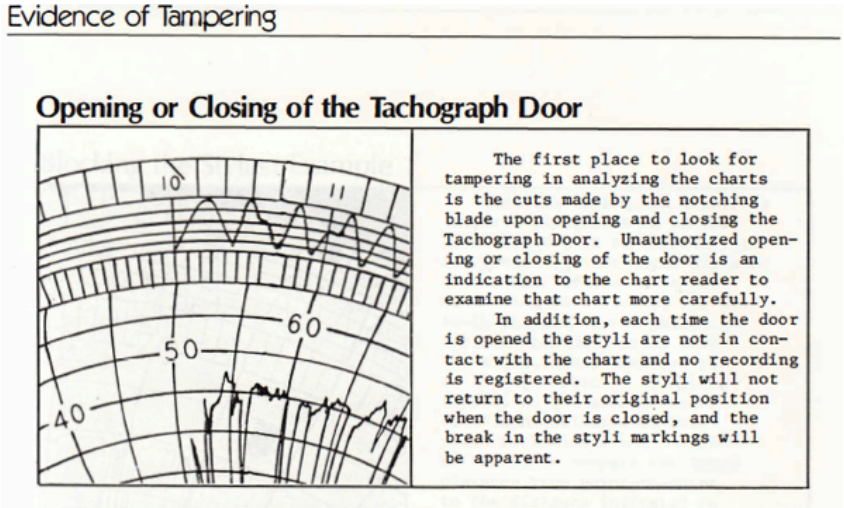


Figure 6.3. Example of tampering detection information from a 1970s tachograph manual. (source: "Tachograph Chart Reading: A User's Resource Guide," Gemco Truck Products Division/Engler Instruments Operation)

As EOBR technologies have evolved, so have schemes for tampering with them. Most devices use GPS to track a truck's location; some drivers cover the GPS transmitter on the truck's roof with tin foil or a large metal bowl, which can prevent a satellite from detecting the transmitter. Other drivers purchase illegal after-market GPS jammers intended to accomplish the same thing.[2] Trucker message boards are replete with drivers anonymously sharing tampering tips:

[2] Interestingly, GPS jammers can have unexpected externalities. A recent *Economist* piece described how truckers' GPS jammers routinely disrupt timestamps on financial trades at the London Stock Exchange, navigation systems in cars, mobile phone signals, and aviation systems

> fyi, there are TWO power wires so if you are thinking of unpluggin from the fuse panel you have to unplug both of them, with one unplugged the keyboard will appear dead but the system can still record certain things, the company you work for can still query the system directly and get a response[.] with both wires unplugged the system is completely shut down, at least the older systems are. one wire is a 5 amp and the other is 25 amp.
>
> on most systems you can also turn the key on and off several times and it will shut the system down, I do this a lot to conserve on battery power.
>
> just do as I do and wrap a piece of Aluminum foil around it and secure it with small bungy cords. this will stop the Transmit and receive but, it will not prevent it from recording your speed or how many times you stop.

Some high-end fleet management systems are integrated with internal cameras, directed at the driver, which record his actions as a means of control and training. Drivers reported to me that they would cover up the small camera lenses with duct tape or popsicle sticks, or would draw over them with black Sharpie, in order to avoid being watched.

Of course, as with most technological systems, the capabilities of the device advance over time to thwart common tampering schemes like these. Technology vendors and truckers are locked in an arms race of neutralization and counter-neutralization techniques (Marx 2009), as EOBR manufacturers figure out ways to close loopholes as they are exploited. For instance, some devices now record data streams in two parallel encrypted formats; if the two streams do not match, it raises a red flag that the device has been tampered with. And generally, the systems signal irregularities to the company (e.g., if a satellite signal is temporarily lost); technology

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(Anon 2013). In 2013, a New Jersey truck driver was fined $32,000 after a $100 GPS jammer—which he had plugged into the truck's cigarette lighter to avoid being tracked by his company—caused interference with a system used to guide pilots to the runway at Newark airport (Thompson 2013). The jammers are also popular with truck thieves in order to avoid being traced after a theft.

vendors often supply companies with training that instructs them about how to detect tampering of this sort.

Digital manipulations

A second set of strategies involves *digital* tactics in order to violate legal or organizational rules.

Data edits. In the most overt case of data manipulation, truckers and firms affirmatively misrepresent their driving time by editing EOBR data in the "back office." EOBR software typically provides the capability for managers to make retrospective edits; there are plenty of situations in which a manager might legitimately need to edit a trucker's data (for instance, a driver forgets to log in; an EOBR malfunctions; the satellite signal cuts out in a rural area and fails to capture a change of status). But some respondents told me that dispatchers sometimes made these edits to give drivers extra time behind the wheel, in order to make a crucial pickup or delivery window without "service failing" the load.

Since EOBRs are not yet mandatory, this technique does not currently seem to be widely used. If a trucking firm is of the type that routinely makes data edits to facilitate illegal activity, it is also unlikely to have voluntarily adopted electronic monitoring; it's likely that those firms are currently relying on paper logs, which are much easier to falsify. But when EOBRs become mandatory, we might expect this strategy to be employed more frequently.

Perhaps the reason data edits have not yet come into broad use as a resistance strategy is that EOBR software commonly flags data that have been retrospectively edited—a feature not

unlike the "breaking the glass" mechanism in some access control models. "Breaking the glass" is a means of manually overriding general access restrictions (i.e., to gain access to information to which one would not typically have access) in exigent situations (Ferreira et al. 2006; Narayanan 2013); the system grants access, but also automatically sends a notification to the user's superior of the access. The design aims to preserve system flexibility while creating a measure of accountability to prevent unauthorized use. In a similar move, to manually edit EOBR data, the dispatcher or fleet manager often is required to input a text explanation for any manual changes, especially changes involving driving time; these data are also flagged, and would be likely to undergo additional scrutiny in the case of an internal or government safety audit.

Ghost logs. Perhaps the most straightforward way to gain extra driving time is to drive using multiple driver IDs. Most EOBRs require drivers to log in using a username and password in order to authenticate himself. However, drivers commonly have access to multiple username/password combinations—perhaps because another driver has "lent" them, or because the company has furnished multiples to him, or because he knows of a "demo" or "dummy" account he can use (which many firms have, either for training purposes or to cover lags between employment of a driver and the time at which he's entered into the electronic system). He can simply log off when his legal limits have been met, and then log in again as another user. This practice is a descendant of a similar practice involving paper logbooks, in which drivers would simply keep multiple sets of logs in the truck.

When "ghost logs" (as they are known) are used, they create holes in the journey that must be accounted for. Imagine that driver John's EOBR records him driving from Indianapolis

to Nashville before his hours run out; John then goes off-duty while a ghost driver, Casper, logs in and takes the load from Nashville to Atlanta. In Atlanta, Casper logs out and John logs in again, having appeared to have gotten some restorative, and legally required, time off work. If John's logs are inspected in Tallahassee, a competent inspector will question how he and his truck managed to get there from Nashville to Atlanta while he was off-duty. John will simply explain that he was "driving team" with Casper from Nashville to Atlanta; that is, he was resting in the sleeper berth while Casper plowed ahead. Where is Casper now? Well, he got out at Atlanta, because the company needed him to pick up a load there. This explanation accords with industry practices (firms do have to move trucks and drivers around the country in various ways to prepare for upcoming hauls, a practice called "power balancing"), and has the additional virtue of being difficult for inspectors to contest.

"Hacking." Finally, some drivers have developed methods to circumvent restrictions imposed by their companies on EOBR use. Though drivers in my research had not (yet!) devised ways to digitally "hack" into the systems in order to falsify data about driving time, some drivers *have* discovered ways to use EOBRs for other unsanctioned activities. For instance, a YouTube video posted by a trucker named Scooby Tulsa—which has been viewed over 6,000 times—shows how to access a solitaire game on his "built-in snitch," the Qualcomm MCP200.

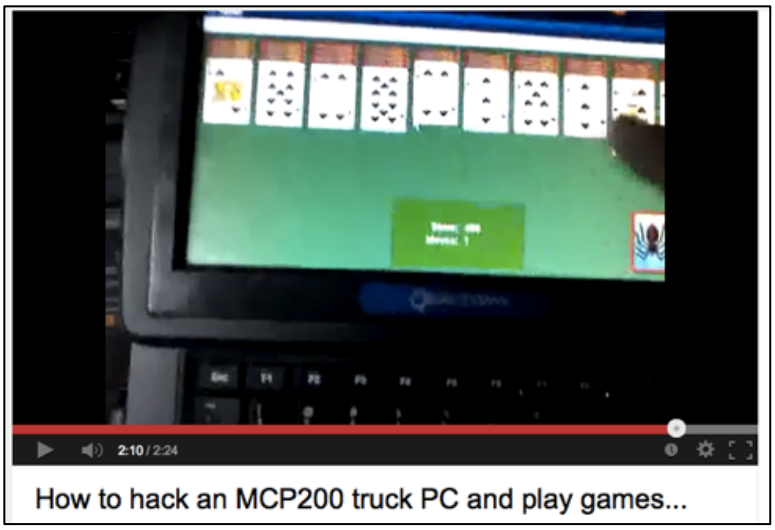


Figure 6.4. Screenshot from YouTube video demonstrating how to access games on an EOBR device. (source: youtube.com)

Though this behavior may seem trivial—this guy just wants to play solitaire!—the video evidences another dynamic at play. The trucker's narration of the hack depicts deep resentment of the electronic device and scorn for the company that requires it. In a derisive tone of voice, he says:

> Say you want to get to the games, but say that your douchebag company says, 'hey, you don't get to play games. We're gonna gray that shit out [the interface button for games access] so you can't fuckin' touch on it no matter what.' Here's what you do.

The trucker then demonstrates what you do: he presses the top of the screen seven times, then control + escape on the keypad, which brings up the Windows XP start menu. From here, he shows how to access built-in games as well as a web browser; he also describes how to install other games, like Quake, using a thumb drive. (Comments on the video, which was posted in 2012, indicate that this workaround is no longer effective; commenters presume that subsequent

software updates blocked this capability.) The trucker's action is far from playful: despite the fact that the circumvention does not get him any additional driving time, it is nonetheless an act of defiance that evinces his contemptuous relationship to the technology, and the company that put it there. Because this form of resistance is temporary, evasive, and unlikely to significantly upend structures of power (nor is it seemingly intended to do so), it can be understood as an exemplary "weapon of the weak" (Scott 1987)—or what Ewick and Silbey, drawing on Foucault, describe as a tactic of "anti-discipline": "dodges, ruses, and feints … [that] rarely leave a structural imprint" (1991:748).

Exploiting technical limitations

Mislogging non-driving work. Other strategies involve exploiting the limits of the electronic device's capabilities. Though EOBRs automatically track driving time and location, they fail to capture other types of data that might more accurately reflect a driver's actual work time. The most significant of these is the time drivers spend waiting to be loaded and unloaded at shippers' and receivers' terminals, called "detention time." These wait times can be excessively long—the owner-operators' association estimates that they can sometimes reach as high as 30 to 40 hours per week—and drivers are usually unpaid for this time, though they often need to remain alert (to supervise loading processes, to move the truck around the terminal, to safeguard the truck's freight). These wait times can cause significant problems for legal compliance, as a driver facing a long delay may run out of available hours to drive to his next destination (recall that the driver may be on duty for only one 14-hour window per day). Many drivers maintain that

it is this long, uncompensated work time that creates the *real* fatigue and unsafe working conditions in the industry.

Drivers are legally required to log detention time as "on-duty, not driving"; this time counts toward a driver's 14-hour daily duty window and 70-hour weekly duty limit. But a driver has little incentive to log this time accurately, because exceeding these limits interferes with the time when he can legally drive (and make money). EOBRs are not capable of detecting work activity when a truck is not moving; as such, loading/unloading time is manually entered by drivers into the devices, and many drivers log it as off-duty time instead in order to preserve work hours. Drivers often similarly mislog other non-driving work duties, like legally mandated daily inspections of the truck (which, if done thoroughly, can take up to half an hour). Mislogging often takes place with the knowledge, and sometimes under the explicit direction, of trucking firms, as the next example illustrates.

Rolling to stops. Another method of exploiting the limitations of electronic monitoring involves strategically gaming technical thresholds. Many EOBR models categorize a truck as "driving" (and thus, its driver as being on duty) when it is detected as having moved a certain distance, or at a certain rate of speed; these thresholds are built into the devices, though organizations can often set the specific limits via back-office preferences. But in practice, dispatchers can conspire with drivers to avoid triggering these thresholds and to buy some extra work time.

In one of my observations at a trucking firm, a driver had very little time remaining on his 14-hour duty clock and 11-hour driving clock, yet was still a few miles from his pickup point.

The dispatcher instructed the driver to park the truck at a Walmart he was approaching,[3] and to record himself as being off-duty on his EOBR. At that point, the driver was legally required to take a 10-hour rest break in order to gain more work time. But the dispatcher instead instructed the driver to "roll" the remaining handful of miles to the pickup point, *at a speed of less than 15 miles per hour*, in order to avoid triggering the EOBR from registering the truck as "driving." Once the driver reached his destination, the dispatcher instructed him to load the freight—which also could not be detected by the monitor. The driver did as he was instructed, rolling and loading, all while remaining (officially) on an off-duty rest break.

What was especially striking about this incident was that the dispatcher had, not an hour before, told me that the carrier for which she worked "ran 100% legal." The company was proud of its high safety rating, and distanced itself from carriers that racked up violations of the hours-of-service rules. Yet, in full view of an observer, this dispatcher did not hesitate to tell the driver how to break the law without getting caught. When the dispatcher hung up with the driver, I had fully expected her to look at me sheepishly, or to offer some awkward explanation for why lawbreaking was justified in this instance. But nothing of the sort happened; instead, she continued on with her work, moving on to the next driver interaction without justifying the circumvention to me.

Similar incidents occurred in my observations at other fieldsites, in which fleet managers would inform me that they were strict about not letting drivers exceed their legal limits, as evidenced by their voluntary adoption of EOBRs; yet, when I watched those managers confer with drivers about (most typically) how to log undetectable nondriving work time, they told them

[3] Walmart stores are well-known among truckers for usually allowing trucks to park in their massive lots; in fact, given the dearth of public funding for truck parking, many drivers have come to rely on the national network of Walmarts as *de facto* truck stops where they can sleep undisturbed and stock up on supplies.

(explicitly or implicitly) to mislog it; in one instance, for example, a dispatcher told me that the company had determined that a legally compliant truck inspection could take place in no more than eight minutes, so drivers should log that amount (regardless of how long the inspection actually occurred, or for that matter, whether it occurred at all).

The practices suggest a conflation of legality with the avoidance of detection. "Officially" —if by official, we mean according to verifiable electronic records—these firms are operating legally. But by exploiting the limitations of the recordkeeping capabilities of the monitors, firms can *appear* compliant while in fact running their operations in ways that are not, in fact, compliant. Dispatchers and fleet managers were quite casual in revealing these practices to me. Vaughan (1982:1383; quoting Stinchcombe 1965:175) notes that during periods of rapid change, organizations may engage in unlawful behavior because "'what is very generally at stake is the definition of what is deviant.'" Here, firms' personnel seem not to consider such practices to be deviant, a construction that is unsurprising given that it aligns with long-held industry norms.

Organizational practices

Departure. Other truckers use organizational practices (without technical components) to resist monitoring. The brute force form of dissent in this context is simply to opt out by quitting one's job at a company that is deploying monitoring technologies. In trucking, quitting one's job is not as personally disruptive as it could be in another occupational sector; because drivers are mobile and mostly work alone, they lack the auxiliary social commitments that build up around a typical workplace (office friendships, daily routines, nearby childcare, or other "side bets" that

support long-term commitment to a particular organization (Becker 1960)). Moreover, trucking is a highly transferable skill—trucking for one firm is nearly indistinguishable from trucking for another—and the current nationwide driver shortage enables drivers to be hired by another company immediately. Thus, truckers are not particularly brand-loyal employees; as previously described, the rate of turnover in the industry currently stands at around 100% per year for large carriers and 80% for small firms (Transportation Research Board 2010).

This said, departure from a firm can serve as a form of resistance again that firm's policies with regard to electronic monitoring. A number of drivers told me that they had left firms when those firms installed EOBRs, or that they *would* quit if their current carrier did so. Organizational exit of this sort is a form of "voting with one's feet" by removing oneself from the situation (Hirschman 1970).



Figure 6.5. Advertisements for trucking firms promote lack of EOBRs as a recruitment tool.

Of course, if and when a federal EOBR mandate comes into effect, organizational exit will become less effective. Many drivers maintain that at that point, they will quit trucking altogether; of course, whether this intent will be borne out into action remains to be seen. As one driver put it:

> As a truck driver and otherwise employed in the industry since 1966, during which time I have not killed or injured anyone, I will tell you this: *The day the government puts an EOBR on my truck will be the the [sic] last day I ever drive a truck*. I know I am not alone in feeling this way. Most drivers I talk to share these feelings. We have to abide by enough rules and regulations that no other motorist deals with without this added insult. *(regulatory comment; emphasis added)*

Many truckers say they will leave trucking *altogether* if the government mandates electronic monitoring. Though not all of these truckers are likely to actually make good on the threat of departure, history suggests that drivers *do* respond to undesirable policy changes through industry exit. In 2013, FMCSA tightened rules related to drivers' hours of service, by further limiting the hours truckers could drive and mandating additional break periods—a change many drivers did (and still do) consider to be objectionable and unnecessary constraints on their productivity. In the 90 days before the new rules took effect, Werner Enterprises—one of the nation's largest trucking firms—reported that the share of drivers between 60 and 67 years old driving for the firm fell by half (Dills 2014). The departure of older drivers is particularly concerning from a public safety perspective: these drivers, who tend to be the most vehemently opposed to electronic logging, also have more industry experience and are involved in accidents at lower rates than younger drivers. Should these "old hands" leave the industry in droves in response to electronic monitoring, their jobs will presumably be filled by new "baby drivers" (in trucker parlance) who are more likely to be involved in accidents.

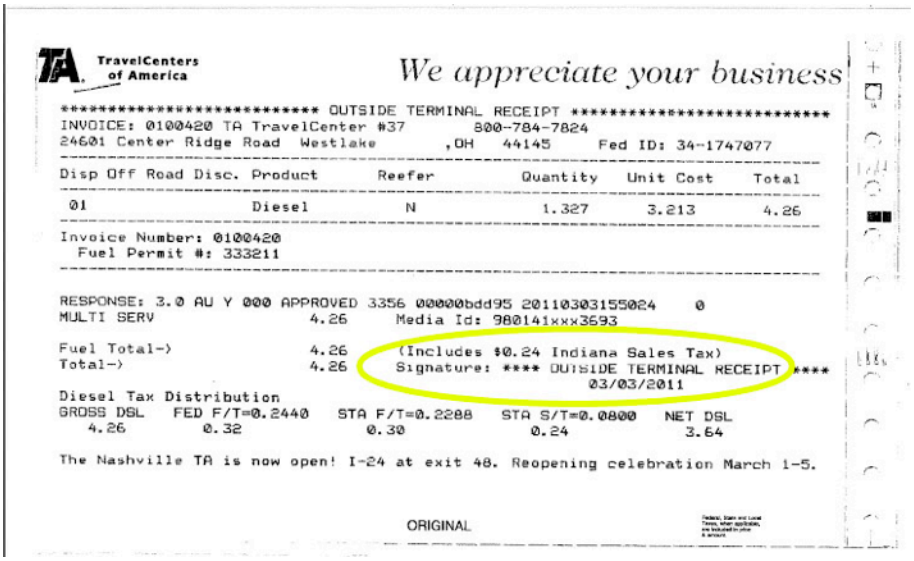
Collaborative omission. One interesting resistance strategy involves collusion between truckers and seemingly disinterested third parties: truck stops. Truck stops' stake in the use of electronic monitoring in trucking is not immediately obvious. But they *do* have an interest in competing for truckers' business, and exploit truckers' desire to circumvent the hours-of-service regulations as a means of doing so.

This strategy is specifically oriented around the "supporting documents" rule (49 C.F.R. §395.8(k); *see also* 75 Fed. Reg. 32984 (2010)).[4] When a law enforcement officer inspects a

[4] The Federal Motor Carrier Safety Administration is in the process of revising and clarifying the federal regulations around supporting documents in light of the pending EOBR mandate;

driver's time logs—in paper or electronic form—he or she asks the driver for documents that substantiate his recent whereabouts, in order to assess the veracity of his logs with respect to when the driver was at a given location. These documents can include bills of lading, toll slips, inspection records, and—importantly—receipts for fuel or other services at truck stops. Because truckers stop at truck stops frequently to refuel, buy food, take showers, or for other reasons, drivers commonly keep such receipts in the cab.

Knowing that many truckers have an interest in "flexibly" logging their time, some truck stops have begun providing receipts that list a location and date *but not an exact time* at which a transaction occurred. Doing so prevents an inspector from using the document as a "tattletale" if the trucker's paper or electronic log would not corroborate the time of the transaction, and thus provides an incentive for truckers to patronize those truck stops that provide such documentation.



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INVOICE: 0100420 TA TravelCenter #37 800-784-7824
24601 Center Ridge Road Westlake ,OH 44145 Fed ID: 34-1747077

Disp	Off Road Disc.	Product	Reefer	Quantity	Unit Cost	Total
01		Diesel	N	1.327	3.213	4.26

Invoice Number: 0100420
Fuel Permit #: 333211

RESPONSE: 3.0 AU Y 000 APPROVED 3356 00000bdd95 20110303155024 0
MULTI SERV 4.26 Media Id: 980141xxx3593

Fuel Total-> 4.26 (Includes $0.24 Indiana Sales Tax)
Total-> 4.26 Signature: **** OUTSIDE TERMINAL RECEIPT ****
03/03/2011

Diesel Tax Distribution

GROSS DSL	FED F/T=0.2440	STA F/T=0.2288	STA S/T=0.0800	NET DSL
4.26	0.32	0.30	0.24	3.64

The Nashville TA is now open! I-24 at exit 48. Reopening celebration March 1-5.

ORIGINAL

Figure 6.6. Truck stop receipt displaying date, but not time, of transaction. (source: www.apexcapitalcorp.com)

however, it is quite likely that supporting documents will still be required in some form. See 79 Fed. Reg. 17656 (2014).

I refer to this form of resistance as *collaborative omission*. The strategy depends on the actions of multiple parties, some of which are external to the enforcement relationship. And unlike some of the other forms of resistance discussed, like material tampering, this tactic appears more passive; the trucker is merely doing what is required of him by providing supporting documentation, and maintains the ability to disclaim the intent to mislead. In fact, surely, many truckers provide non-timestamped receipts *without* any resistant intent.

"Decoy" compliance. In Chapter 5, I explained how truckers play upon human law enforcement officers' perceived reluctance to inspect timekeeping data from EOBRs by strategically signaling that the monitors are present in the truck, via truckside decals. As described, truckers who engage in this practice rely on the hope that inspectors, who have discretion as to which truck to pull into a bay, will choose not to select them for inspection. This *simulation* of compliance has led to a "black market" for decals, which several of my respondents alluded to, and evidence of which can be found on online trucker forums. These practices can be understood as another form of resistance to regulatory surveillance.

Resistance as networked negotiation

As this chapter suggests, resistance takes multiple forms, from more technical to more social (understanding, of course, that the social and technical are always intertwined). It varies from blunt smashing to digital tinkering to social signaling; from overt, communicative action to covert maneuver; from solo endeavor to coordinated effort. Resistance can be passive (this is just the receipt they gave me!) to indisputably active, from expressive to instrumental. Data can be

falsified, omitted, obfuscated, or its collection thwarted in the first place. Resistance in the truckers' case is multivalent and multidirectional, in reflection of the surveillant regimes it encounters. As surveillance becomes a primary instrument of relational control among multiple institutional and governmental actors, sometimes in concert with one another, resistance practices too evolve to reflect this complexity (Martin, Van Brakel, and Bernhard 2009; Fernandez and Huey 2009).

Moreover, the trucking case complicates notions of resistance as being a counterstrategy against authority writ large. Rather, the diverse set of practices I have detailed illustrates that resistance in the trucking case is *relationally networked* for the purposes of *negotiating power dynamics* within social, organizational, and legal relationships. It is too simple to assume—as most contemporary theorizing about resistance does—that resistance is by necessity a "bottom-up" phenomenon, user-motivated, or even, for that matter, necessarily user-empowering. Rather, resistance in the trucking case reveals resistance as bricolage (Lévi-Strauss 1966) in which available skills, resources, and actors (human and non-human alike) are mobilized in various arrangements for the purposes of achieving a wide variety of ends. Resistance brings actors into temporary regimes of alignment and collaboration (Gillespie 2007) in order to enact maneuvers that *may or may not* serve the ultimate ends (social, economic, cultural) of the party who appears to be the chief "resistor" (here, typically, the truck driver), but which do serve as tactics for the negotiation of relational power. In so doing, the trucking case empirically animates the Foucauldian notion that

> [T]here is no single locus of great Refusal, no soul of revolt, source of all rebellions, or pure law of the revolutionary. Instead, there is a plurality of resistances, each of them a special case[.] … [R]esistances … are distributed in irregular fashion: the points, knots, or focuses of resistance are spread over time and space in varying densities[.] … Just as the network of power relations ends by forming a dense web that passes through apparatuses and institutions, without

> being exactly localized in them, so too the swarm of points of resistance traverses social stratifications and individual unities. (Foucault 1980:95–96; quoted in Ewick and Silbey 1991:731)

Electronic surveillance in trucking is, as I've described, a legal/organizational hybrid, intended as a tool to enforce federal regulations while also providing a means for organizational performance monitoring. Some of the resistance practices I describe are directed at evading law enforcement, while others are directed at avoiding employer-originated surveillance. Trucking firms, even as they are surveillors themselves, can also act as resistors against government monitoring, by tinkering with back-office data or instructing their employees about how to game technical thresholds. Even seemingly disinterested third parties get into the mix, as truck stops offer receipts that enable truckers to log their time more flexibly.

The table on the following page generalizes some of the key actors enrolled, resources mobilized, and aims implicated by the resistance strategies I have detailed.

Resistance strategy	Key human/organizational actors in the negotiation	Key nonhuman objects/actors	Primary surveillor	Type of resources and knowledge mobilized	Primary motives	Overt or covert
Brute force	trucker; ~ other truckers (if coordinated)	EOBR, hammer, dry ice	firm	technical, organizational	identity preservation	either
Electromechanical interference	trucker, ~ other truckers (shared info), truck stops/aftermarket device vendors	EOBR/tachograph, coins, foil, bowls, GPS jammers, interruptors, fuses, message boards	firm, law	technical, organizational	identity preservation, economic	covert
Data edits	firm, eobr vendors/trainers (instruction)	EOBR back office data entry system	firm, law	technical, organizational	economic, org standards	covert
Ghost logs	trucker, ~ firm (sanctioning practice or providing alternative login)	imaginary trucker, paper log or EOBR, login/password info	law	technical, law enforcement practice	identity preservation, economic, org standards	covert
Games hacking	trucker, other truckers (shared info)	EOBR, YouTube videos	firm	technical	identity preservation, fun/pleasure	covert
Mislogging non-driving time	trucker, firm, ~ terminal managers	EOBR or paper logs	law	organizational, law enforcement practice	economic, org standards	covert
Rolling to stops (gaming thresholds)	trucker, firm	EOBR, truck itself	law	technical, organizational (threshold settings)	economic, org standards	covert
Organizational departure (industry exit)	trucker, ~ trucker's family/personal community	--	law	organizational	identity preservation	overt
Organizational departure (inter-firm)	trucker, firm	advertisements	firm	organizational	economic, identity preservation, org standards	overt
Collaborative omission (un-timestamped receipts)	~ trucker, truck stops, firms (truck stop partnerships)	EOBR or paper logs, truck stop receipts	law	organizational, law enforcement practice	economic, org standards	overt but easily disclaimed
Decoy compliance (decals)	~ trucker, ~ firm, law enforcement officers, EOBR vendor (supplies decals), ~ other truckers, ~ sign shops	decals, truck itself, message boards	law	law enforcement practice	economic, identity preservation, org standards	an overt facade

Table 6.1. Summary of resistance practices. ~ denotes sometimes.

The complexity of this chart reveals the inadequacy of understanding resistance as simply generalized, bottom-up subject-against-power activity. Each of the strategies detailed in this chapter implicates *multiple* human and organizational actors acting in relation to one another, not merely a lone-wolf trucker vigilante (even though this imagery is often employed). The tactics vary by target (occupational performance monitoring vs. legal compliance oversight vs. both) and by principal aim, from preservation of occupational identity to financial gain to submission to firm rules and incentive regimes. And finally, the strategies vary in their visibility—some "work" only when implemented covertly, while others are inherently communicative in nature and depend on being unconcealed.

Moreover, each of the strategies I have described involves the deployment and mobilization of particular material or digital objects—a decal, a piece of foil, a password, the truck itself—and different domains of knowledge, from technical (this is the fuse to disconnect) to organizational (this is the miles-per-hour driving threshold set by the trucking company and enabled by the EOBR vendor) to law-enforcement-practice-oriented (these are the skills and limitations of inspectors). These non-human objects and knowledge domains are not merely incidental to the resistance strategies, but form core elements (or actants (Akrich 1992; Callon 1987; Latour 1988)) within the networks in which these resistance strategies are deployed. We can identify two key mechanisms by which nonhuman objects function as actors with respect to resistance.

First, nonhuman objects bring human and organizational actors into technical and social alignment or misalignment toward different aims. Perhaps the clearest example of this is the non-timestamped truck stop receipt. By issuing receipts without timestamps, truck stops—who seem *prima facie* to be disinterested third parties with respect to truckers' hours-of-service

compliance—align themselves with truckers and trucking firms who want to obscure legal violations in an easy and defensible way, against which inspectors have little recourse. The receipt is the node through which the truck stop is enrolled in the resistance strategy. These seemingly innocuous truck stop receipts, then, become political objects that conscript actors into, and distribute power within, the network (Winner 1980), making certain forms of resistance possible.

Second, nonhuman objects impose moral, and here *legal*, frameworks on their users by prescribing certain courses of behavior onto human actors. These prescriptions relate to the different forms of human action afforded by technical objects (Gibson 1977) to which competencies have been delegated (Latour 1992)—that is, we outsource human enforcement functions to these objects, and are then subjected to the scripts those objects prescribe back onto us (Akrich 1992), which may or may not accord with changing social realities. Objects prescribe morality by enabling certain forms of behavior while making others more difficult, and thus function as moral and legal actors in their own capacities. A paper log affords more flexibility than an EOBR in that it is easily falsified and difficult to interrogate. EOBRs, though clearly not tamperproof, do make "flexible" logging more difficult and are more easily verified (at least by qualified actors—as the previous chapter reflects, law enforcement inspectors are not always able to adequately access or interpret the data they produce). But when users choose not to comply with the legal and moral courses of action imposed by these objects—when users cease to be docile (Akrich 1992; Foucault 1977)—moments of resistance arise in which the objects themselves are de-scripted, through electromechanical tampering, data edits, unsanctioned use (e.g. Solitaire playing), threshold gaming, and the like.

Implications for understanding resistance

Consideration of these networks of resistance practices—composed of people, organizations, institutions, digital and physical objects, and domains of knowledge—leads us to three implications of the truckers' case for sociolegal study of resistance generally. I describe these implications below.

Making sense of self-exploitation

First, understanding resistance in this way helps us to reconcile a paradox alluded to in Chapter 2: the idea that, through some acts of resisting (driving with "ghost logs," decoy compliance, mislogging non-driving hours, etc.), truckers in fact reinforce economic structures that serve to exploit their labor and jeopardize their health and safety. When truckers' resistance stands in opposition to the hours-of-service limitations, resistant truckers are simply enabling themselves to work longer, dangerous hours (during which they put themselves and the motoring public at risk), in conditions comparable to sweatshop labor (Belzer 2000). So even seemingly trucker-led resistance can be understood to be self-exploitative; truckers' resistance serves to reproduce and entrench the economic and class structures that underlie industrial capitalism (like the working-class boys considered by Willis (1981), who similarly "take a hand in their own damnation" (p. 3)). As described in Chapter 2, truckers' resistance, though often painted with a cultural veneer of cowboyism and machismo, is a function of short-term economic necessity (recall the trucker who noted that for many truckers "the lights wouldn't be on at home if they weren't breaking the law").

These strategies become even more comprehensible when we consider resistance as a means of negotiating networked relationships. The trucker who, for example, drives with a ghost log is not merely acting in opposition to the law. He is also actively negotiating his relationship with his employer, who may have provided the resources for this subterfuge, and whose exerts significant economic influence (and possibly even direct coercion) over him. In addition, we should consider *who benefits* when resistance practices are used. In some of the cases I describe—for instance, the dispatcher instructing the driver to "roll" to a terminal, or the mislogging of inspections and detention time—the trucking *firm* is the beneficiary of the resistance practice; the trucker himself may not even be willing to participate in it, but may be coerced into doing so.

Truckers whose resistance practices are primarily intended to thwart *organizational* surveillance are also engaged in networked negotiation. When a trucker disrupts his GPS receiver using an aftermarket jammer, or disconnects a fuse after a fellow trucker has instructed him in how to do so, he is often aiming to get extra driving time, which means he can earn more money from the company. But in many cases, it also cements his identity in relation to his community. It can serve a collectivity-defining interest (perhaps especially if the practice is overtly communicative, as in the coordinated hammer-smashing case), or, even if executed individually, connects him to the longstanding cultural values of his occupation: independence, the capability to tinker meaningfully with machinery, defiance at being told by an authority figure how to conduct one's work, and affiliation with a pool of knowledge resources that can be mobilized and communicated to other truckers. This view leads us to reconsider what the aims of resistance are—or what resistance is *for*, even in the absence of institutional change or collective action.

As Ewick and Silbey (2003) suggest, everyday acts of resistance become sociologically significant when they construct *meanings and narratives* for their participants which lay bare their relation to structures of power. Such dynamics are evident in the trucking case, as resistance practices, even if economically self-exploitative, provide resources for truckers to make sense of and negotiate the occupational communities and institutional networks in which they are located.

Sociotechnical non-use

Networked resistance also helps us think about how *non*-use of a sociotechnical system may also be read as a response to, and interaction with, that system. Wyatt (2003) clarifies that non-users, as well as users, serve integral roles in shaping and interpreting the meanings of technologies. Non-users are not merely potential users or not-yet-users; they have variable relationships to technologies, ranging from voluntary rejection to sociotechnical exclusion (lack of access); they may have used the technology previously and stopped, or may never have used at all.

Wyatt's call for taking non-use seriously resonates in the trucking case. Truckers' non-use of EOBRs takes many forms and stems from multiple motivations. Non-use can take the form of emphatic rejection, as when EOBRs are physically destroyed; it can be achieved through organizational maneuvering, as when truckers exit one firm and move to another (perhaps one that explicitly advertises its lack of EOBRs as a recruitment benefit); it can be strategically concealed, as when truckside decals falsely announce an EOBR in order to mask non-use while still reaping some of its benefits. Non-use here functions as a means of preserving cultural identity and traditional ways of getting one's work done.

Moreover, non-use has real effects on organizational, technical, and legal components of the sociotechnical system. Widespread organizational exit in order to achieve non-use might mean the exodus of experienced drivers, to be replaced by younger drivers more prone to accidents. The desire for non-use, as made visible through electromechanical interference tactics that interrupt the functionality of the EOBR, leads to an arms race as EOBR vendors design tamper-proofing features meant to keep such circumventions from occurring. These features then become formally inscribed in law, as federal regulators are currently considering which tamper-proofing and data security specifications will be legally required in the soon-to-come EOBR mandate.

New rule/practice gaps

Finally, the truckers' case contains a lesson about law and technology. As discussed in Chapter 1, technological rule enforcement strategies—from red-light cameras to digital rights management to biometrics—are habitually hailed as panaceas for compelling compliance. Material and digital artifacts are considered more durable and consistent than error-prone, arbitrary, resource-intensive humans are (Latour 1992; Winner 1980), and automation is understood to neutralize the discretion and fallibility of both human enforcers and enforcees (Zittrain 2008). The move to enforcing rules digitally is often accompanied by a wave of rhetorical optimism that technology will "close the gap" between regulatory intent and social practice, by minimizing the human element and compelling obedience. The truckers' case is no exception; as one industry VP put it, "electronic logs take the noncompliance issues off the table."

But resistance demonstrates that the gap-closure rhetoric accompanying digital enforcement is incomplete. As we have seen, resistance, in all its forms, constructs *new* gaps between rules and real practices. Resistance is inevitable, though its guises and effects are far from predictable. Sociolegal scholarship ought to take resistance seriously in order to understand the social effects of the surveillance society.

Chapter 7. Driving Regulation: Using Topic Models to Explore Political Contention Around Electronic Monitoring[1]

As described in Chapter 2, the EOBR has factored into federal regulatory proposals about trucker timekeeping since the 1980s. In the course of these rulemakings, stakeholders in the EOBR debate—truckers, firms, and other interested parties—have submitted thousands of comments to federal agencies for their consideration in formulating the rules at issue. These comments are a source of rich textual data for understanding the discursive frames stakeholders bring to the electronic monitoring issue. Electronic monitoring is hugely contentious within the trucking community, and has engendered vigorous debate among stakeholders around issues like safety and privacy. In this chapter, I analyze these data using a new computational text analysis method in order to illuminate the salient issues and discursive frames at play around electronic monitoring in trucking.

Why look at regulatory processes? Rulemaking as a source of sociological data

The bulk of this dissertation uses a range of qualitative methods to analyze how the EOBR, once deployed into the field, reconfigures social relationships among a range of stakeholders. I have emphasized the importance of examining on-the-ground practice in order to

[1] This chapter stems from analysis I did in collaboration with a research assistant in computer science, Michael Franklin. For transparency, a note about the division of labor for this analysis: I was responsible for data collection and some processing steps (hand-coding attributes, running optical character recognition programs, transcription) while Michael completed others (implementing the de-stemmer and various filters). Michael wrote all the modeling scripts, and ran them at my direction, though he also suggested fruitful ideas for varying parameters and additional analysis. I was responsible for interpretation of the results and writing up the paper. We worked jointly on the figures. My collaboration with Michael resulted in a co-authored paper on which this chapter is based (Levy and Franklin 2014).

evaluate the effects of technological enforcement regimes. In this chapter, I change course somewhat by considering how EOBRs are rhetorically framed by these stakeholders in political processes, and by using a distinct method, automated text analysis. This analysis augments the ethnographic data on which the rest of the study draws, in three ways.

First, regulatory processes illuminate how techno-legal regimes are socially constructed, in that they may serve as sites of *closure* in which the meanings of artifacts are stabilized. When a technological artifact is designed and introduced into use, social groups with stakes in the artifact engage in processes of meaning-making around it, interpreting what it is, what and whom it is for, and how it will (or will not) fit into a group's social world (Kline and Pinch 1996; Pinch and Bijker 1984). Over time, closure mechanisms stabilize these meanings and stave off the *interpretative flexibility* inherent in artifacts (though perhaps temporarily). These closure mechanisms can be sociocultural or technical in nature. In Kline and Pinch's analysis, closure is often brought about by actions of manufacturers—for instance, through advertising, or redesign that supports certain uses and forecloses others. But the regulatory process offers an alternative sphere in which closure may be achieved, when the rules adopted by a legal body privilege and ossify one set of meanings over others. As such, attention to political processes like rulemaking can be a fruitful sphere of inquiry for understanding processes of technological interpretation.

Second, the use of an alternative investigative method offers an opportunity for *methodological triangulation*. My ethnographic data collection and analysis provide me with significant knowledge of the issues EOBRs introduced into the field. But bringing another dataset and a wholly different analytic method to bear on the problem provides an alternative lens that serves as a useful check on field research. For reasons I address in this chapter,

computational text analysis in particular can serve as a good methodological complement to ethnographic work.

Finally, and most generally, agency rulemaking is a unique context in which to examine sociolegal contention—but one in which new computational methods and new data accessibility provide new possibilities for social science research. Agency rulemaking provides a structured arena in which any member of the public can submit substantive feedback to an agency while it is actively formulating new policies. Public comments provide insight into stakeholders' viewpoints about contentious political issues, but have been largely untapped to date as a data source by social scientists. Until the last decade, public comments were not accessible in easily analyzable formats, as comments were typically submitted to agencies by mail and only viewable via a trip to the National Archives or an agency docket room. The same characteristics that make these comments a rich arena for political participation create challenges for researchers who wish to analyze them. Document corpora can be extremely large (in some cases, thousands of documents for a particularly controversial rulemaking), making them unwieldy for qualitative analysis. And because comments consist of unstructured textual data, they are more difficult to measure and quantify than other forms of political participation, like voting in elections.

In light of these difficulties, few previous studies of regulatory comments have used text analysis methodologies to analyze this political forum (though researchers have conducted machine-learning analyses of comments in other fora; see, e.g., Diakopoulos and Naaman 2011). But new online repositories and analytic methods are beginning to open up this trove of data for researchers. The online comment portal *regulations.gov* facilitates participation in rulemaking processes by allowing comments to be submitted and viewed online; in combination with the aggregation efforts of pro-transparency organizations, these data are newly available to

researchers in largely machine-readable formats. And new methods that facilitate the analysis of large collections of documents hold much promise—in particular, probabilistic topic modeling (Blei, Ng, and Jordan 2003; Blei 2011) allows researchers to systematically and inductively identify key latent themes in a text corpus. My examination here is an exploration of how computational methodologies, married to new data sources, might complement traditional investigative techniques in sociology (DiMaggio, Nag, and Blei 2013).

In this chapter, I use topic models to uncover thematic patterns in public comments on the proposed electronic monitoring regulations in trucking. In addition, supplementing the model with covariates labeling commenter identity enables us to identify systematic differences among the interests and evaluative principles that different groups of stakeholders emphasize. In so doing, I identify alternative discursive frames that characterize political debates around the EOBR as a techno-legal artifact.

Background: Public participation in rulemaking

Federal agencies are required to seek and consider public input on most new proposed regulations via "notice-and-comment" procedures, in accordance with the Administrative Procedure Act (5 U.S.C. § 553). An agency officially notifies the public of a new proposal by publishing it in the Federal Register; this publication triggers a period of at least thirty days during which anyone—including individuals, interest groups, corporations, or other government entities—can submit any comment to the agency regarding the proposal. (In some cases, rules go

through multiple rounds of notice-and-comment.) The agency is then required to consider these comments in formulating a final rule.

Traditionally, a party interested in submitting a comment needed to find the published notice in the Federal Register and mail the comment to the agency—a high bar for action that effectively dissuaded most everyday citizens from participating in a meaningful way (Coglianese 2006; Mendelson 2011). The federal government began efforts to make commenting available online in the 1990s, and launched *regulations.gov* in 2003. The site allows for the submission and viewing of comments online, and is intended to open up the regulatory process by facilitating greater public access. (Whether these "e-rulemaking" efforts have actually increased meaningful participation, however, is a matter of considerable debate (Coglianese 2006; Cuéllar 2005; Shulman et al. 2003).)

The comment process is a unique form of political participation from both agency and public perspectives. To the agency, notice-and-comment is largely a data-gathering mission. The process ostensibly permits agencies to draw on interested parties' expertise for rules that may be highly technical or detailed. Topics of regulation are often very specific and fine-grained, so it is to agencies' advantage to have interested parties provide them with relevant research (but see Wagner (2010) for a critical take on information exchange in rulemaking). In addition, agencies often have close enforcement relationships with the industries most closely affected by new regulations, so it is advantageous to foresee potential problems and "take the temperature" of a field before a rule is passed.

From a public perspective, the comment process offers a unique forum in which to provide feedback to a governing body while it is formulating new rules. Unlike electoral

participation or direct democracy measures, regulatory commenting allows for regular, unstructured, substantive participation in government in a formalized arena.

Yet, substantial critiques exist regarding how effective commenting is as a tool for influencing policy, as well as the extent to which comment processes may be "captured" by resource- and expertise-rich corporations and special interests rather than everyday individuals. Legally, agencies are required to "consider" comments to a proposed rule, but this bar is relatively low: agencies need not respond specifically to the concerns articulated in comments; and contrary to the beliefs of many, the number of comments for or against a particular proposal is not binding (i.e., comments are not "votes") (Coglianese 2004b; Mendelson 2011).

I do not focus in this chapter on these evaluations of rulemaking as a political process, which have been ably addressed by other researchers (Coglianese 2004a; Cuéllar 2005; Golden 1998; Wagner 2010; Yackee 2006). Rather, I make use of rulemaking as a *data site*. Despite their debatable efficacy, public comments undeniably provide unique insight into the political concerns, values, and frames articulated by participating stakeholders around contentious political issues—and are newly accessible to researchers thanks to their recent online availability.

An additional note is in order to clarify the nature of comment data. Public comments are a form of strategic political speech, aimed at influencing a regulatory body to undergo a particular course of action. The comments stakeholders provide in this arena, as such, should not be read as "pure" statements of interest that map directly onto what, or how, they *think*. Rather, the comments reveal how stakeholders *talk* about electronic monitoring in this particularized context, and with specific persuasive aims. To be sure, different discursive modes employed by

different stakeholders are indicative of their level of sophistication and experience with regulatory processes, as well as their substantive concerns.

Topic modeling for analysis of textual data

Rich data sources demand rich methodological strategies for their analysis. Previous analyses of public comment data have generally concerned the *process* of rulemaking, and are most commonly critiques of the effectiveness of public comment on substantive regulatory outcomes. I take a different approach here, tapping comments as a data source for understanding alternative framings of contentious political issues.

Probabilistic topic modeling enables us to analyze a large corpus of comment text. Topic modeling is an exploratory strategy that allows us to detect the latent thematic structure of a set of documents (Blei 2011). In this analysis, I use *latent Dirichlet allocation* (LDA), a simple type of probabilistic topic model (Blei et al. 2003).

LDA generates "topics" as lists of words, drawn from the vocabulary used in the text corpus; the topic is based on the distributions of those words over the vocabulary. The topics are generated inductively by the model based on the likelihood of words to co-occur within documents. LDA produces the topics through a probabilistic approximation of Bayesian inference. Starting with a set of seed topics (often randomly generated), the algorithm iteratively alters these topics to best match the set of data being learned. LDA also generates proportions for each document for each topic, so that each document can be described as being proportionally composed of (or, interpretively speaking, "about") a number of topics, which are expressed by

the words used in that document. For details about the algorithmic and computational aspects of LDA, see Blei et al. (2003).

Topic modeling is a good match for a data source like public comments. Because the procedure is automated, it enables analysis of much larger text corpora than would be feasible by hand. Since topics are generated inductively by the model and not predefined by the researcher, the technique protects against implicit coding bias caused by the constraints of researcher knowledge. And because the method assumes that a single document can contain multiple topics (in contrast to some other document clustering methods; see Blei and Lafferty (2009)), it enables researchers to draw insights from interrelations among themes, both within documents and within the dataset as a whole.

As described, public comments are rich data because commenters express all manner of concerns in unstructured ways. Comments run the gamut from technical specifications to personal stories, and from thoughtful reflection to threats and name-calling. Many comments defy easy categorization as being for or against the proposal at issue. Thus, hand-coding such documents can be a particularly difficult task; topic modeling appeals because it can uncover hidden patterns in even a varied set of documents. To my knowledge, this is the first study making use of topic modeling to analyze regulatory comment data. Previous analyses have commonly relied on hand-coding (Cuéllar 2005; Golden 1998; Krawiec 2013; Wagner, Barnes, and Peters 2011; Yackee 2006); however, see Kwon et al. (2006), Cardie et al. (2008), and Lau et al. (2005) for notable discussions of other machine-learning approaches to regulatory comment data.

The electronic monitoring debate in trucking is an ideal site for examining political contention, as the proposed regulations attracted comment from a wide variety of parties,

motivated by very different concerns. Divergent frames characterize what the EOBR debate is "about" for different stakeholders, and what evaluative principles they use to understand and form opinions about the regulations at issue (Boltanski and Thévenot 1999). Because the issue is framed in many different ways, the parties tend to "talk past" one another. In addition, because many individuals (primarily truck drivers) submitted comments, the debate allows us to see differences in rhetoric between individuals and the organized interests that often dominate regulatory comment processes.

Research approach

Obtaining and processing the data

Despite the fact that comments are newly available online, a number of processing steps were required to assemble our dataset and prepare it for analysis. As described, most comments are viewable via the *regulations.gov* online portal, which also permits bulk download of comment metadata for a particular rulemaking (e.g., commenter name, date of submission, etc.)—but not, at this time, bulk download of the text of the comments themselves. Fortunately, the Sunlight Foundation—a nonprofit organization devoted to using technology to increase government transparency—produced a web scraper that allowed us to bulk-download the text of comments from the 1997, 2004, and 2010 rulemakings. Most documents were already in machine-readable format, either because they were entered as text into the website comment field directly, or because they were uploaded in .doc or .pdf formats and digitized by Sunlight using optical character recognition (OCR). Approximately 200 comments, most of which were handwritten submissions mailed to the agency, had not been digitized; these comments were hand-transcribed.

The 1997 proposed regulation was a broad proposal that included provisions about EOBRs as well as other aspects of trucking policy (for example, proposed changes to the number of hours truck drivers could drive). That proposal generated a good deal of public feedback (about 23,000 written comments), much of which was irrelevant to the EOBR provision we were interested in. In order to filter this docket to relevant comments only, we generated a list of 59 "inclusion words" ("EOBR," "logbook," brand names of EOBR manufacturers, etc.) derived from our reading of other comments on the issue; only comments including one or more of these words were included in the analysis. Based on our review of the results, we believe this filter process was over- rather than under-inclusive (i.e., included some irrelevant comments in the dataset rather than omitting relevant comments).

For completeness, we also wanted to include comments from the 1987 rulemaking, which predated *regulations.gov* and were not available online. This data was obtained by scanning these documents manually at the National Archives in College Park, Maryland; they were then digitized using OCR and hand-transcription.

With our data assembled, we performed two additional pre-processing steps. First, we excluded all documents from the dockets that were not identified as "comments" (for example, regulatory evaluations performed by the FMCSA). Second, some documents were labeled as being from "Multiple Submitters"—these were typically multiple discrete comments that had been combined by FMCSA into one (ostensibly for administrative purposes). These were excluded from our analysis, since having multiple unconnected authors of a single "document" would violate the underlying assumptions of the model.

We performed four main processing steps on the remaining data to create the "dictionary" for the topic model. First, we stemmed all of the words (reducing, for instance, *play*,

plays, and *played* to a single word). Next, we filtered out common "stopwords" (*the*, *a*, and so on). We also removed words that were only a single letter, or contained only digits. These are common artifacts of errors in the OCR process or the formatting of mailing addresses, but are not relevant to the content of the comments. Finally, we restricted the dictionary to the 10,000 most common words. This reduces "noise" in the analysis, while eliminating things like unique typos.

As we have described, one advantage of topic modeling is that it inductively exposes latent themes without a researcher having to prespecify what those themes are. However, as is the case with any methodological strategy, topic modeling requires the researcher to make a number of analytical choices in setting up and interpreting the model. For us, these include things like the number of topics in the model, parameters affecting the sensitivity of the model, and the point at which the model is considered to have stabilized before it returns results. Because the goal of topic modeling is to explore themes in a corpus, the interpretability of the topics is of paramount importance; thus, we made these choices in order to maximize topic interpretability and, ultimately, to reveal substantively interesting information (Grimmer and Stewart 2013:20). This approach prioritizes the utility of the model as a means for discovery in place of statistical measures of model fit, which may be less semantically meaningful (Chang et al. 2009; Grimmer and Stewart 2013).

With our data processed, we performed the LDA analysis, fitting the model to our text corpus of 1.7 million words across 3569 documents. We ran multiple instances of the model with different numbers of topics, starting from randomly selected seeds, and obtained quite consistent thematic results across runs; for interpretability, we selected a representative 8-topic model, reproduced in Table 1. (The order of topics is not meaningful.) In light of our prior domain

knowledge about the trucking industry, the topics are readily recognizable as relating to major issues in the EOBR debate. We provide some interpretations below.

Results

Exploring themes of the debate

Topic 1	Topic 2	Topic 3	Topic 4	Topic 5	Topic 6	Topic 7	Topic 8
sleep	util*ity*	fatigu*e*	eobr	propos*e*	propos*e*	electron*ic*	propos*e*
work	work	dut*y*	carrier	cost	construct*ion*	compan*y*	day
shift	regul*ate*	study	require	carrier	industr*y*	propos*e*	work
fatigu*e*	oper*ate*	safet*y*	system	operat*e*	dut*y*	eobr	rest
day	propos*e*	period	data	safet*y*	safet*y*	address	make
perform	vehicl*e*	vehicl*e*	motor	regulat*e*	period	make	park
schedul*e*	safet*y*	crash	vehicl*e*	require	day	safet*y*	road
night	exempt	accid*ent*	compliance	industr*y*	attach	work	home
study	emerg*ency*	carrier	hos	increas*e*	work	log	compan*y*
oper*ate*	power	rest	dut*y*	addit*ion*	transport	industr*y*	load
effect	electr*ic*	motor	operat*e*	motor	concret*e*	request	year
period	employ*ee*	fhwa	devic*e*	dot	limit	support	stop
de	day	report	cost	transport	deliv*ery*	pay	week
circadian	require	research	electron*ic*	duty	maximum	september	duty
report	compan*y*	highway	safet*y*	fatigu*e*	compan*y*	law	attach
test	line	day	status	agenc*y*	product	problem	problem
worker	dut*y*	data	log	compan*y*	washington	road	sleep
alert	state	operat*e*	technolog*y*	benefit	clerk	load	regulat*e*
safet*y*	period	sleep	enforc*e*	impact	road	owner	forc*e*
fhwa	worker	work	support	type	december	regulat*e*	run
subject	crew	transport	violat*e*	number	dot	operat*e*	mile
accid*ent*	type	factor	regulat*e*	reduc*e*	operat*e*	shipper	require
manag*e*	motor	commerci*al*	standard	result	deliver	hos	accid*ent*
transport	hos	effect	locat*ion*	rest	nation	enforc*e*	box
dut*y*	transport	limit	specif*ic*	year	dc	govern*ment*	famil*y*
number	restor*e*	perform	unit	percent	nprm	trucker	industr*y*
data	respond	require	issu*e*	estim*ate*	highway	track	area
al	respons*e*	risk	perform	effect	street	put	safe
increas*e*	custom*er*	percent	report	state	seventh	cost	peopl*e*
regul*ate*	commerci*al*	schedul*e*	includ*e*	small	sw	peopl*e*	break
research	includ*e*	flight	fleet	work	mix	year	december
factor	industr*y*	measur*e*	rods	accid*ent*	increas*e*	box	put
system	call	propos*e*	agency	busi*ness*	flexibl*e*	devic*e*	pay
cmv	employ	involv*e*	mandat*e*	day	require	issu*e*	tir*ed*
thc	system	regulat*e*	question	administr*ation*	room	includ*e*	unload
result	accid*ent*	passeng*er*	state	nation	regulat*e*	carrier	live
human	feder*al*	bus	manag*e*	highway	project	speed	find
task	part	increas*e*	paper	econom*ic*	improv*e*	busi*ness*	nprm
health	outag*e*	state	manufactur*e*	crash	profession	paid	long
railroad	limit	hos	review	includ*e*	busi*ness*	violat*e*	back

Table 7.1. Unsupervised 8-topic model. The table displays the 40 highest-ranked words for each topic (i.e., words with the highest prevalence within a topic). Words were "stemmed" in the model (e.g., *propose*, *proposes*, and *proposal* are treated as the same word, *propos*, for analysis)

but have been rewritten as full words here for clarity when applicable. α for this model (a measure of sensitivity) was initially set to .01. Words are restemmed for interpretation; italics indicate the letters I have manually appended for ease of reading (e.g., "feder" is presented as "feder*al*").

Topic 4 contains words like *eobr*, *system*, *device*, *electronic*, and *technology*, and thus clearly pertains to the monitoring devices at issue in the proposed regulations. Some words reflect discussion about technical specifications for the devices (*data*, *standard*, *manufacture*, *location*), while others suggest the relationship between technology and compliance with hours-of-service (HOS) rules (*enforce*, *compliance*, *hos*, *log*).

Topic 7 also includes words that refer to the monitoring devices, like *eobr*, *electronic*, *log*, and *device*—but also contains terms that suggest an alternative frame around the issue. Topic 7 contains the telling words *problem*, *track*, and *box*—the last a common term used by truckers to refer to EOBR devices, as in "black box." (For a sense of how these words appear in context, consider this excerpt from a representative comment: "I resent the need for a black box on my truck to track what I am doing. I am a safe and honest driver.")

Other revealing words in Topic 7 include *pay*, *paid*, *load*, and *shipper*. These terms initially appear to be outside the scope of the pending rules as defined by the agency, but they suggest a set of concerns that places the electronic monitoring debate in the context of broader problems plaguing the trucking industry, regarding long waits for trucks to be loaded and unloaded at shippers' and receivers' terminals (called "detention time"). These wait times, sometimes several hours, are often unpaid for drivers, and can cause significant problems for hours-of-service compliance, as a driver facing a long delay may run out of available hours to drive to his next destination. Notably, this was also the only topic that included *trucker* as a high-ranking word.

What does electronic monitoring have to do with these industry problems? In some respects, they are discrete issues; the proposed regulations do not concern detention time or driver pay. But my ethnographic research on this issue suggests that to many truckers, the issues are inextricably linked in two ways. First, many drivers facing long delays at shippers' terminals have traditionally "fudged" their time logs in order to make up for lost time and money, and electronic monitors would remove this flexibility in executing their work. Second, many drivers feel that the electronic monitoring effort treats *them* as "the problem"—as untrustworthy liars—rather than what many see as the root cause, disorganized shippers who delay their passage. A common sentiment among drivers is that EOBRs are used to treat drivers like criminals, rather than professionals who are doing their best to negotiate difficult logistics in the face of countervailing demands. Taken together, then, Topic 4 and Topic 7 demonstrate starkly different frames around what monitoring devices mean: in one sense, the regulatory debate is about the EOBR as a technological device, and the salient terms of debate are over things like technical specifications. In another, the debate is about the EOBR as a tracking device, and the discourse is bound up with much broader concerns about the industry.

Topic 8 also addresses broader trucking industry issues, also containing words like *box*, *load*, *pay*, and *problem*, and adding terms like *unload*, *home*, *family*, and *park*. Another broad industry problem, from truckers' perspectives, is the dearth of safe parking near the highway for drivers who have run out of hours; drivers commonly fudge their logs in order to find somewhere safe to stop for the night. In addition, many are concerned that stricter enforcement of hours-of-service rules would keep them away from their homes for longer periods, since trips are expected to take more time.

Topic 1 and Topic 3 both concern fatigue and sleep, a central motivator for regulating truckers' work time. Though we expected that fatigue would be a prominent theme in the comments, these topics revealed something we did not expect: two different frames for talking about sleep and fatigue. While both topics contain some of the same high-ranking words (*fatigue*, *sleep*, *period*, *perform*), Topic 3 is much more trucking-specific and reflects the relationship between sleep and road safety (*crash*, *highway*, *risk, vehicle, carrier*) while Topic 1 reveals a frame that relates sleep to human biology (*circadian*, *human*, *health*, *alert*). The division between themes is not 100% distinct (e.g., the word *accident* appears in both topics), as is to be expected given the fact that all comments were submitted to address a trucking safety issue; yet, the multiple sleep-related topics suggest that alternative frames around the topic of sleep and fatigue exist in the EOBR debate.

Other topics also suggested themes that struck us as plausible and informative. Topic 5 suggests themes having to do with quantification of the costs and benefits of the proposed rules (*cost*, *benefit*, *percent*, *estimate*, *economic*, *increase*, *number*). Topic 2 and Topic 6, with words like *utility*//*electric*/*power*/*outage* and *construction*/*concrete*/*mix*, respectively, make sense in light of utility and construction companies' vigorous arguments that their work is distinguishable from general trucking and should be exempted from the regulations; Topic 6 also contained a number of words relating to agency entities and addresses, which are likely in part an artifact of the comment data (e.g., address blocks on some comments).

Revealing differences between stakeholder groups

We also were interested in understanding how *different groups* of commenters framed their remarks around electronic monitoring. By pairing the themes identified by the topic model

with data about commenter identity, we are able to analyze relationships between these identity groups and the language used in comments submitted by those groups. In order to facilitate comparisons between subsets of the data, we coded each comment based on whether the commenter was an individual (e.g., a truck driver or concerned citizen) or an organization (like a trucking company or a technology vendor). The distinction between citizen and organization is, to be sure, a very rough heuristic, and one that reflects political construction rather than social reality (Schudson 1998); individuals are socially embedded in networks and organizational contexts, and these ties are sometimes reflected in the statements they tender (for instance, if a company encouraged or required its employees to submit comments during the rulemakings).

Despite this, we selected the organization/individual axis for comparison for three reasons. First, previous research on regulatory processes has found that organizations and individuals tend to bring different types of concerns to the table in commenting on proposed regulations (Cuéllar 2005; Wagner 2010; Yackee 2006). Second, our intuition based on our research in the trucking industry was that truck drivers (who generally submitted as individual commenters) would likely frame electronic monitoring issues differently than large organizational interests. The third reason was pragmatic: because the determination could usually be made using document metadata, it was feasible for us to hand-code this attribute for over 3500 comments. (We initially anticipated coding documents based on more fine-grained commenter identity—truck driver, family member, insurance firm, etc.—but quickly found this to be infeasible, both in terms of our resources, and because many comments failed to specify the commenter's identity with this level of specificity.)

Individual/organization coding determinations were largely based on comment metadata, i.e., fields for commenter first and last name and organization on the *regulations.gov* submission

page. In some cases, when metadata were not available or were ambiguous, we looked for identifying information in the text of the comment, based on explicit identification or other characteristics of the comment (e.g., the use of "I").[2]

Because LDA generates topic proportions for each comment as well as the topics themselves, we were able to discern the degree to which each comment was proportionally "about" each of the topics in the model. For interpretation, a comment would have proportion 0.15 for topic Y if the model assigned 15% of the words in the comment to topic Y based on probabilistic approximation. We determined proportions for each topic within each comment, and then were able to make comparisons between subsets of the data.

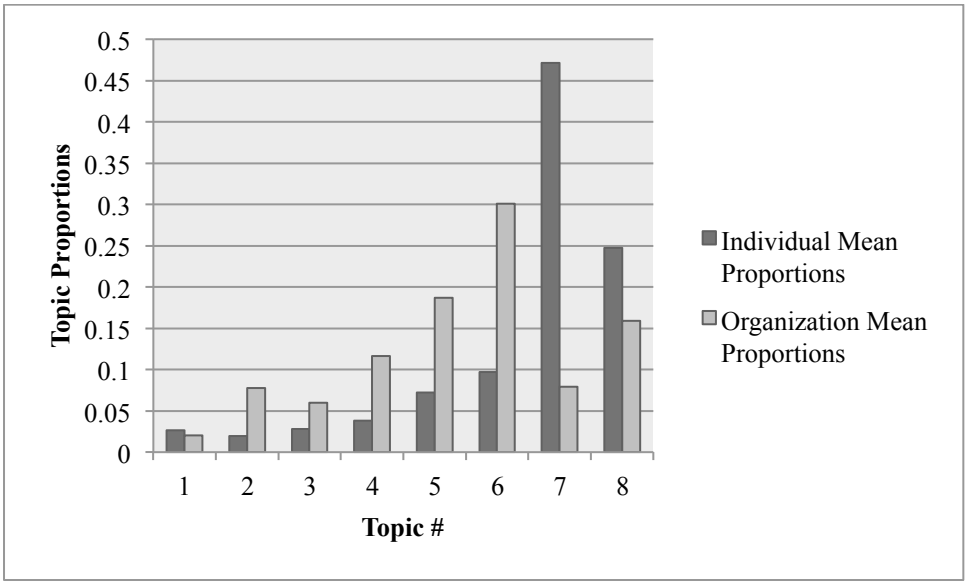


Figure 7.1. Mean topic proportions for individual and organizational comment submitters (N =3531). Except for Topic 1, all differences in means are statistically significant at $p < 0.0001$. The mean difference for Topic 1 is statistically significant at $p < 0.1$.

[2] This technique almost certainly resulted in some categorization errors, though it struck us as infeasible to read the text of thousands of comments in order to categorize commenter identity with perfect accuracy. However, our review of several hundred comments suggested that the categorizations generated by this technique were at least 95% accurate.

Figure 7.1 displays the mean topic proportions for each topic for individual and organizational submitters; all differences are significant to the $p < 0.0001$ level, except for Topic 1. The graph makes two dynamics clear. First, comments submitted by individuals were dominated by the concerns described in Topics 7 and 8—the topics that included unique terms about [black] boxes and tracking (Topic 7), home and family (Topic 8), and problems around loading and unloading delays (both). On average, an individual comment was 47% comprised of Topic 7 and 25% comprised of Topic 8. No other topic in the model accounted for more than 10% of the words in the average individual comment. This suggests that these themes were dominant frames through which individuals (a very large number of which, based on our reading of many of the comments, were truck drivers) viewed the regulatory process around EOBRs. The themes underlying organizational comments, on the other hand, were more evenly distributed across topics.

Comparing the mean proportions for specific topics is also instructive. For instance, contrast Topic 4 (the EOBR "technological" frame) and Topic 7 (EOBRs as tracking boxes, coupled with concerns about pay and shippers). Organizations more commonly employed the technological frame in their comments as compared to individuals (11% mean topic proportion for organizational comments, 4% for individuals) and vice versa for the broader tracking boxes frame (8% mean topic proportion for organizations, 47% for individuals).

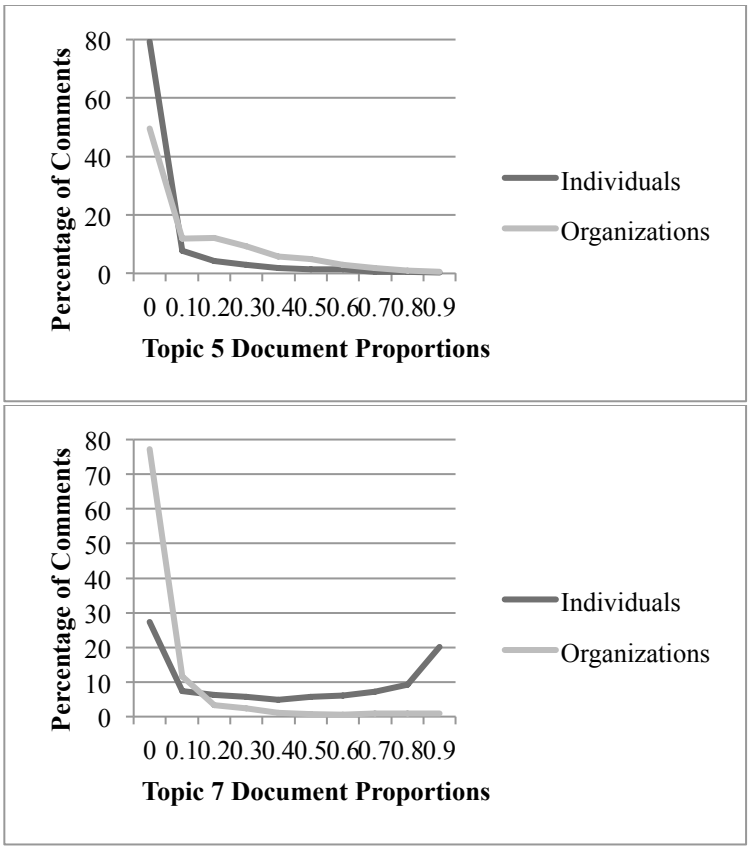


Figure 7.2. Distribution of Topic 5 and Topic 7 proportions across comments (N = 3531).

Looking at the distribution of proportions for particular topics can also be informative. For instance, Figure 7.2 displays the distribution of proportions for Topic 5 (quantification and cost/benefit terms) across comments by individuals and organizations. (Note that a large percentage of comments—79% of individual and 50% of organizational comments—have a topic proportion at or close to zero; this was the case for every topic, and simply indicates that a large number of documents contain no words that are closely associated with the topic, which is unsurprising given the variety of themes that characterize the corpus.) Beyond these values, we see that the lines are roughly horizontal until about document proportion 0.2, and then slopes

quickly down toward the x-axis, indicating that very few comments are highly concentrated around Topic 5.

Contrast this with the distribution for Topic 7 (again, the tracking boxes/shipper/pay concerns topic). Here we see a similar pattern for the organization line—but the individuals line slopes sharply upward at its end, indicating that 20% of individuals' comments were highly (more than 90%) concentrated on this topic. This suggests that the frames and concerns represented in Topic 7 were less likely to be "mixed" with others, perhaps indicating that individual commenters using this frame considered it to represent the entirety of their concerns.

Confirming the results

As mentioned, reliance on statistical measures of model fit may lead to the selection of topic models that are less substantively meaningful (Chang et al. 2009). As such, we do not rely on such measures here. Instead, we use three 'confidence checks' in order to assess the validity and robustness of our findings. First, the salient themes returned by our model are confirmed by the ethnographic data described in the bulk of the dissertation (see Grimmer and Stewart (2013) for discussion of expert evaluation as a validation tool for text analysis). Second, we ran multiple iterations of the model, starting from different randomly selected seeds, and with varying parameters (number of topics, model sensitivity, etc.). Our findings were quite consistent across these iterations.

Third, in order to confirm the robustness of our findings with respect to differences in salient themes between identity groups, we ran secondary models on subsets of the data. For the primary analysis discussed above, we modeled our topics based on the dataset as a whole. In contrast, for this procedure, we first divided the dataset into identity groups (i.e., comments

submitted by individuals and comments submitted by organizations), created separate topic models for each subset, and estimated the topic proportions for each document within the subset. We then applied a statistical inference procedure in order to infer the distribution of these topics on the *opposite* subset. In other words, we built a model to fit the set of comments submitted by *individuals* and applied that model to the comments submitted by *organizations* (and vice versa). Comparing the document proportions generated by this procedure confirmed our primary findings. For instance, the model built on individuals' comments contained topics about problems like shippers' delays and parking; by comparing the estimated and inferred document proportions, we saw that these topics were much less prevalent in comments submitted by organizations.

Discussion

As noted, regulatory comments are submitted to further tactical political aims (to influence the agency toward a particular course of action), and cannot be considered a pure reflection of interests. Nonetheless, these data provide revealing clues about how stakeholders attempt to shape the discourse around electronic monitoring—what justifications and concerns they pose and how they frame them. Our use of comment data for this purpose is distinct from prior research in that we are not approaching such data principally to make findings about the fairness or efficacy of the regulatory process; rather, we use them to attempt to understand the discursive construction of a particular policy debate.

That said, it is worth noting that some of the topics that arose in our analysis—particularly topics that suggest values (like privacy) rather than quantifiable technical or economic evidence, and which situate the electronic monitoring debate in the context of broader

industry problems around detention time, driver pay, and parking—are less likely to be recognized by an agency as it formulates new policies. In fact, this was indeed the case in the trucking debate: in 2010, the owner-operator drivers' association successfully sued the FMCSA over its failure to address driver privacy and harassment in EOBR rulemakings. Previous research indicates that agencies are far less likely to address "unsophisticated" comments (Cuéllar 2005), and that value-based information is more difficult for agencies to manage and less likely to have substantive impact on rules (Steelman 1999). Our analysis here suggests that individuals were more likely to voice such broad and value-based concerns, while the frames used in organizations' submissions were more commonly tailored around quantifiable data and technical specifications.

In this way, the regulatory process illustrates the interpretative flexibility inherent in the EOBR, as relevant social groups bring different meanings to bear on the techno-legal regime being debated. In the trucking case, different orders of worth (Boltanski and Thévenot 1999) and discursive frames surround the EOBR: is it a technical compliance tool to be evaluated using economic cost/benefit terms, or part of a broader framework of logistical issues in the industry that implicates shippers, parking, and family? In the trucking case, the cost/benefit frame is privileged by law (Executive Order 12866, which mandates such analysis for most regulations); broader considerations that couch the new technology in terms of hard-to-quantify values (like privacy and family) or less tractable economic or infrastructural issues (like parking and detention time) are more readily excluded. Thus, regulation is a formalized procedural site in which interpretative closure (Kline and Pinch 1996) can occur via law. In trucking, closure is not complete; as my ethnographic data indicate, the use and meaning of the EOBR remain contested. But the legal ossification of one set of meanings around the technology becomes a touchpoint

around which these broader social and organizational conflicts are structured (cf. Barley 1986), and will have tremendous impact on the possible meanings of the EOBR, especially when a mandate is enacted.

As I have described, automated text analysis on a distinct dataset enables a type of methodological triangulation, allowing us to bring alternative data sources and analytic lenses to bear on a problem. In this case, topic modeling serves as a useful corollary to the primary ethnographic study both for the confirmatory knowledge it provides—i.e., it corroborates my ethnographic research suggesting that truckers interpret EOBRs very differently than do large organizational interests—but also because it can provide other surprising ways of looking at the data. (For example, the existence of alternative framings around fatigue, revealed by this analysis, was not a distinction that I had identified in my fieldwork.) Text analysis methods like LDA can serve as particularly germane complements to ethnographic methods, as both approaches privilege inductive reasoning and the discovery of latent themes; in a sense, LDA attempts to let data "speak for themselves," much as qualitative field research often prioritizes the experiences and emic interpretations of its participants.

Chapter 8. Conclusion: Enforcement in the Age of Surveillance

As the popular press regularly reminds us, we are on the cusp of the age of "big data." The degree to which human behavior can be monitored, measured, quantified, and analyzed—and then correlated, modeled, scored, contractualized, and monetized—is unprecedented (Citron and Pasquale 2014; Deleuze 1992; Mayer-Schönberger and Cukier 2013; Peppet forthcoming). The "big data" turn manifests technically and socially through ubiquitous sensors, tracking apps, 'smart' objects, cheap back-end analytics, and a cultural zeitgeist that valorizes quantitative indicators and predictive ways of knowing; it reaches across scales and domains, from the family to the workplace to the global economy. The quantified self movement, the popular emergence of so-called "data-driven" journalism, and the rise of microtargeted advertising are all specimens of this epistemic shift.

In its emergence, ubiquitous data collection—and the epistemic practices that accompany it—confronts and reshapes social institutions, and the law is no exception. From new avenues for algorithmic discrimination (Sweeney 2013), to police practice (Brayne 2014), to contractual expectations about the use of personal data (Marotta-Wurgler 2012), to providing new evidentiary bases for liability (Newmarker 2007; Richtel 2004), ubiquitous data collection and analysis challenge the operation of law in social life, and call into question what it means to regulate and to be regulated. The idea that digital monitoring *perfects* enforcement, by closing gaps between rules and practices, is one of the chief rhetorics upon which its proponents rely.

The trucking case, however, demonstrates the limitations of this perspective on digital enforcement, by illustrating some of the many ways in which social factors mediate the operation of digital enforcement regimes *in vivo*; I summarize these in the next section.

Gaps, culture, and apparent order

The trucking case highlights the importance of norms, culture, and community practice in enforcement contexts. All rules—and all technical artifacts—must confront social life in their implementation and use. As described in Chapter 1, social life is fraught with fictions, frictions, and expectations that do not necessarily accord with the scripts such rules and artifacts purport to impose. A good deal of social negotiation takes place in enforcement gaps; the technological optimism around digital enforcement technologies often fails to account for such negotiations.

Digital enforcement solutions cannot simply be imposed as "more perfect" versions of the enforcement practice in place before. The means of enforcement matters, in large part because different enforcement technologies afford different degrees of interpretative flexibility (Kline and Pinch 1996) in terms of what meanings social groups ascribe to them—and, importantly, how they afford different meanings of the self and the community vis-à-vis the enforcement regime. Though sociologists of science and technology have long recognized the primacy of interpretative flexibility with respect to technical artifacts, the concept has not yet been explicitly imported to the sociology of law.

Pervasive monitoring challenges existing expectations about the consistency of enforcement by reducing the degree to which the regulated are given a "sporting chance" to evade the rules (Werbach 2006). Yet, as the trucking case illustrates, even as digital monitoring shrinks some rule/practice gaps, it creates others; despite rhetoric to the contrary, humanity and discretion persist in technological enforcement systems, in a number of ways.

- In terms of organizational knowledge flows (Chapter 4), efforts by companies to know more about their drivers' behaviors infringe on traditional spheres of worker autonomy,

cementing truckers' antipathies and challenging their occupational identities. These efforts diminish the value of truckers' traditional knowledge by divorcing data streams from local and biophysical contexts—but also forge *new* social alignments when those data are resocialized within truckers' fleets and families in order to attach economic incentives and competitive pressures to them. These dynamics suggests the persistent, if reconfigured, importance of social factors in the technical system.

- Our consideration of law enforcement practice with respect to analog vs. digital inspections (Chapter 5) suggests that, to the extent technological enforcement appears more "perfect," this perception may be in part be performative, due to the very human enforcement factors still at play (i.e., the more cursory examination inspectors give to digital accounts of truckers' time) or their reluctance to inspect them at all. Even digital enforcement must still contend with human discretion, anxiety, and the need to save face in microinteractions.
- As resistance practices (Chapter 6) demonstrate, electronic monitoring doesn't take noncompliance "off the table" (as a trucking company vice president opined). Rather, on-the-ground noncompliance is widespread, though it may take new forms and require mobilization of new skillsets and domains of knowledge. Along the way, resistance practices realign institutional interests within networks of actors, as stakeholders attempt to negotiate multiplex power relations among themselves.
- Regarding the political discourse surrounding the enforcement regime (Chapter 7), different stakeholders use very different frames in strategic discussions about the monitoring technology. Eventually, regulations may entrench and stabilize certain interpretations of what a technology is *about*, while discounting other possible

interpretations, lived experiences, and cultural values (Kline and Pinch 1996; Pinch and Bijker 1984).

In *Against Security*, his critique of the post-9/11 security apparatus, Molotch (2012) draws a useful distinction between apparent and actual order. He argues that all too often, authorities impose top-down solutions (apparent order) to social problems that ignore the realities of lived experiences and social interactions (actual order):

> [It is b]est to replicate or at least build on people's complexly tacit and mutual means of doing the world rather than trying to invent a world that does not exist. Too often the temptation is to reform through rules and official procedures that can sidestep those usual ways of doing things. …*To create apparent order, you kill the actual order*. ... [Y]ou efface the tacit mechanisms and social work-arounds that people use to get things done[.] (Molotch 2012:215–16, emphasis mine)

In the trucking case, the imposition of a digital enforcement regime—and the use of gap-closure rhetoric to justify it—fails to account for numerous elements of actual order in the industry (highlighted in Chapter 2): the fact that truckers' economic well-being has long depended on widespread noncompliance with federal regulations; the logistic realities of unpaid detention time; the dearth of safe available truck parking (and the lack of political will to build more); the unpredictable contingencies of the public highway, from weather to accidents to traffic congestion; the work pressures, sometimes coercive, from employers; the norms around machismo and masculinity, which manifest themselves both in economic provision for family and in resistance to authority; and the occupational pride and deep-seated identity founded in a long tradition of workplace autonomy. By no means do I intend to suggest that the actual order in the trucking industry is economically equitable, socially just, or without need of reform. Instead,

I suggest that the imposition of an electronic monitoring regime, without additional reforms (Levy 2014), fails to attend to the deeper cultural, social, and economic realities of the industry. It is these realities that necessitate the opening of *new* gaps in which negotiations around these realities can occur.

Additional implications for digital enforcement

In addition to illustrating the continued, if reconfigured, importance of social factors in digital enforcement, the truckers' case has instructive implications for understanding the changing nature of regulation and enforcement more generally—as digital monitoring programs emerge as a perceived panacea for enforcement gaps in a range of institutional domains and at multiple scales (Levy 2013). I highlight two implications here, both of which provide promising avenues for future research.

Mobility and market creep

The trucking case is emblematic of a particular type of behavioral monitoring: location-based tracking. Tracking the location of objects (and, by association, people) as they move across physical space is a control strategy quickly emerging across diverse use cases, from GPS-based school truancy monitoring (Dwyer 2011), to usage-based auto insurance (Peppet forthcoming), to parental tracking of children's mobile phones (Lenhart et al. 2010), to the use of location-tracking alcohol detection bracelets for parolees (Eligon 2010). Location tracking poses

special challenges to our legal and cultural notions of privacy and security (Beresford and Stajano 2003; Lyon 2002; Troshynski et al. 2008).

Even more specifically, fleet management technologies in particular are coming to use in other market segments. A number of tracking systems marketed to commercial fleets are also cross-marketed to families, most commonly for monitoring teenage drivers (a fact that lends support to truckers' claim that fleet management systems treat them like children). This "market creep" suggests the pervasiveness of digital monitoring systems as enforcement tools across domains. Further research might consider the political and economic means by which an enforcement regime migrates to other use contexts, and what cultural assumptions are "built into" technologies by virtue of their origins in a particular domain.

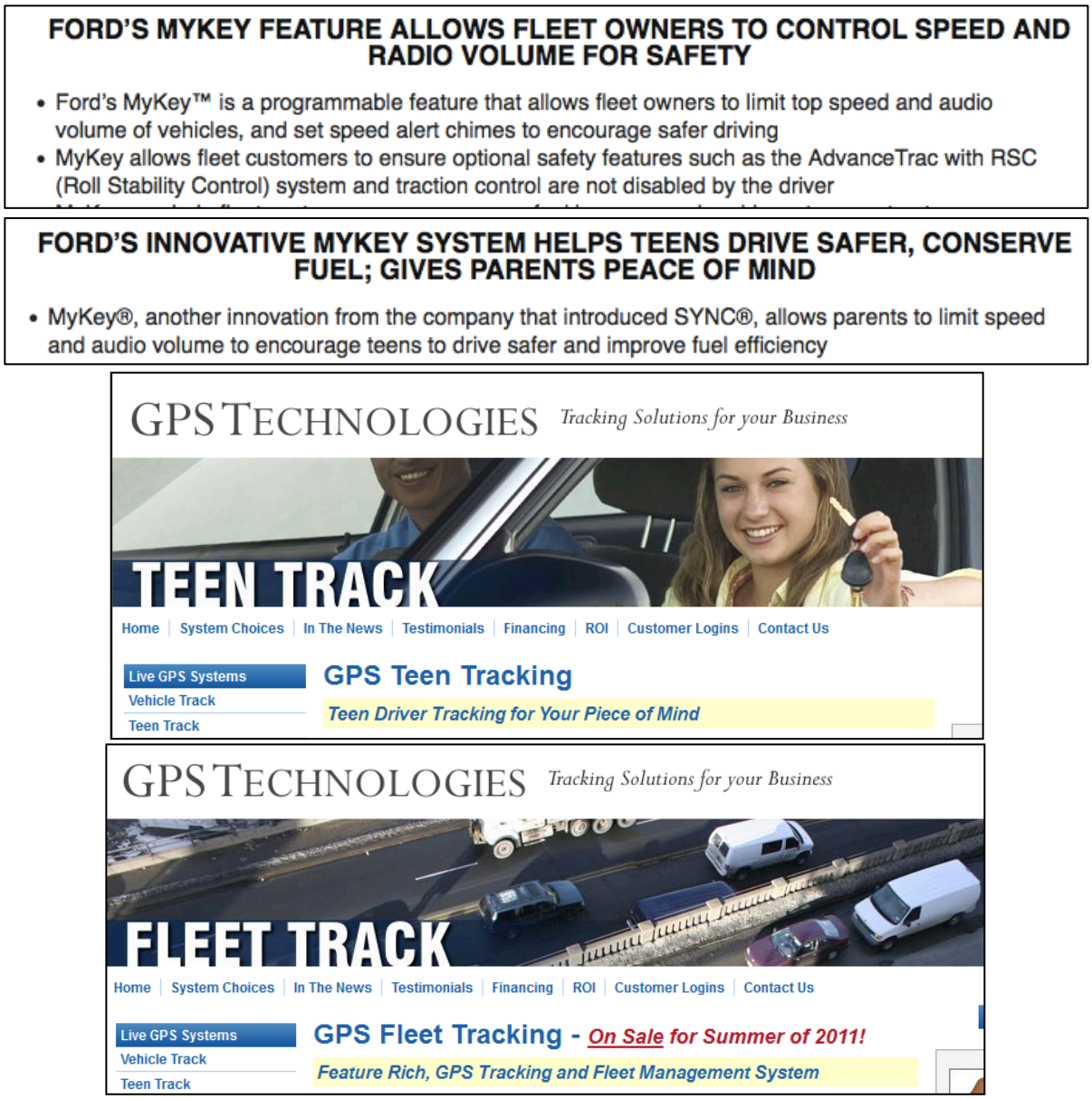


Figure 8.1. GPS Technologies and Ford MyKey tracking systems cross-marketed between fleets and families (press releases and screenshots from 2011).

Public/private hybridity and 'piggyback' surveillance

Second, the trucking case demonstrates a clear instance of the confluence of public and private surveillance into a unified system. Haggerty and Ericson (2000) posited that the

"surveillant assemblage" would soon come to characterize modern life, through the integration of state and non-state components into continuous regimes of monitoring. Our examination here suggests a key mechanism through which such assemblages operate: the "piggybacking" of private surveillance regimes onto public ones, made possible through high degrees of *technical, legal, economic, and social interoperability* among systems.

The government rationale in mandating EOBRs is clear: EOBRs are intended as a means by which enforcement of existing hours-of-service regulations can be made more consistent. The traditional enforcement technology, the paper logbook, is so widely acknowledged as being readily falsifiable that it is treated as an industry joke. Electronic recordkeeping—even though imperfect—seems like a certain improvement for enforcement of a law with clear public safety implications; thus, this state-mandated surveillance of truckers has political legs.

But private interests—namely, trucking firms[1]—also have a stake in surveilling truckers' behaviors. Firms are interested in monitoring truckers' work hours to some degree (though, as I have noted, they also have a competing incentive to turn a blind eye to—or even facilitate—some regulatory worktime violations (cf. Erikson and Bearman 2006, discussing how companies can benefit from malfeasance by individual carriers)); they are especially interested in truckers' other work behaviors that impact their financial bottom lines and allow them to manage their assets efficiently (fuel usage, off-route miles, and real-time locative data to which customers are

[1] Though I have focused primarily on trucking firms in this dissertation, these are not the only non-state actors with a strong interest in monitoring truckers' behaviors. Most notably, the auto insurance industry is rapidly shifting toward usage- and behavior-based models for determining risk profiles and premium rates (Peppet forthcoming). Though commercial fleet auto insurance is idiosyncratic in some ways (for instance, it is dominated by small personal agencies rather than large ones), EOBRs and FMSs are poised to deliver data to insurers that help them to make more precise actuarial determinations of risk. Currently, some commercial auto insurance carriers offer a "plug-in discount" for digital monitoring—that is, having electronic monitoring systems installed (from which the insurer is permitted to access data) entitles the insured firm to a discount, but the specific data are not yet widely used to calculate rates.

coming to expect access). Here, this non-state surveillant interest effectively piggybacks on the state interest; that is, the scaffolding that undergirds the public stake in monitoring also supports private stakes, bringing multiple surveillant interests into alignment with one another.[2] Multiple categories of scaffolding come into play:

(A) Technical. As discussed in Chapters 2 and 4, EOBR (hours-of-service) functionality and fleet management capabilities are increasingly *bundled* into the same interoperable hardware device and software system. The current proposed EOBR regulations would mandate that truckers install devices that track particular types of information—the hours a truck is being driven, and its location—and not necessarily other information about the driver's behavior. But since EOBR functionality is commonly a *module* within a broader set of monitoring functions in a single device, these two surveillant regimes are highly technically interoperable.

This idea applies both to the inclusion of auxiliary fleet management features, as described, and to the precision of monitoring. The EOBR regulations currently in force do not require a device to monitor drivers' real-time exact geolocation, but instead require that the device record vehicle location at least once every 60 minutes (49 C.F.R. § 395.16(f)(3); the pending mandate would likely require greater precision). But in practice, the great majority of EOBR devices on the market record and transmit location constantly via GPS technologies. As such, the realized surveillance capacity of the devices far exceeds that required by the current rule.

At one regulatory advisory meeting I attended, representatives of independent owner-operators (from OOIDA and the Teamsters) briefly advocated for the new regulations to *require*

[2] It is worth noting that such piggybacking often occurs in the reverse direction, i.e., public surveillance making use of non-state tracking infrastructures. Most notably, as the Snowden revelations made clear, the National Security Agency has bolstered its own surveillance of US citizens using tracking cookies and locative data from private companies like Google and Apple (Soltani, Peterson, and Gellman 2013).

"dumbing down" EOBR devices by un-bundling functionalities—that is, to require that government-mandated EOBR devices *not* contain auxiliary fleet management features, in the interest of preventing driver harassment. However, the great majority of committee members were strongly opposed to such a requirement, primarily on the basis that it would be economically inefficient for firms to have to duplicate functionality in separate devices.

(B) Legal. As FMCSA has recognized, "companies use [these devices] to enforce other company policies and monitor drivers' behavior" (Federal Motor Carrier Safety Administration 2006:10) for purposes *other than* compliance with the timekeeping rules. As discussed in Chapter 2, though the current and proposed regulations prescribe only a limited surveillance capability, the requisite cost/benefit analyses conducted by FMCSA have based their cost calculations on the widespread adoption of the Qualcomm (now Omnitracs) fleet management system (the MCP-50, a relatively low-end system, but one that is compatible with a wide range of auxiliary monitoring capabilities; see Figure 2.4). The Agency used this fleet management system as its cost benchmark based in part on the fact that Qualcomm has the largest FMS market share in North America (FMCSA-2010-0167-0485, Proposed Rule, Electronic Logging Devices and Hours of Service Supporting Documents). Though the proposal does not *require* the purchase of this system in particular, its use as a standard in regulatory documents suggests legal recognition of the reality that, in practice, legal and business surveillance interests are deeply entwined.

(C) Economic. As discussed, an EOBR mandate provides a business rationale for firms to monitor driver behaviors *not* covered by the regulation, by reducing the marginal expense of such monitoring (since they will be required to install compatible hardware anyway). In addition, the mandate serves the interests of large carriers (who are far more likely to engage in driver

monitoring) over owner-operators and very small fleets. Individual drivers and small carriers do not reap the same benefits from fleetwide analytics, and the purchase and installation of EOBR systems do present an additional economic barrier to entry into the industry for small firms. Thus, it is unsurprising that large firms have lent their political support to an EOBR mandate.

(D) Sociocultural. Finally, state and business surveillance are socioculturally compatible with one another. This is not to say that either is happily accepted by drivers; rather, the confluence of both forms of surveillance together means that neither is its own unique intrusion, and that they are difficult for drivers to disentangle. In my conversations with drivers, it was very common for them to conflate the surveillance directed at them from companies and the surveillance directed at them from the government (believing, for example, that the government had automatic "back-office" access to all data collected through an EOBR/FMS—in fact, this access is not automatic, as described in Chapter 5, and FMCSA does not appear to have an interest in amassing data about, for instance, fuel use or braking patterns).

Though I have separated these categories analytically, in practice they overlap inextricably and feed into one another (e.g., firms' economic interests influence their inputs into regulatory processes; technical standards become instantiated in legal rules). Legal, sociocultural, economic, and technical interests are tightly coupled and mutually constitutive in the EOBR case. Taken together, these synergies make public and private systems of surveillance pragmatically inseparable. The layering of surveillant interests through interoperable[3] and mutually supportive rules and standards result in a greater net monitoring capacity than that which either the state or the corporation might achieve on its own. These features are worthy of

[3] See Palfrey and Gasser (2012) for a detailed treatment of the virtues and dangers of highly interoperable technical systems.

further study in other enforcement contexts, as they may undergird wholly new, multimodal regulatory dynamics in the digital age.

The trucking case, then, provides a site in which to examine the multifaceted interplay of law, organizations, technologies, and cultural norms, as digital enforcement emerges across contexts. Empirical examination of how such regimes perform in action will be imperative for understanding the nature of social regulation in the digital age, and for formulating policies around new regimes of digital control.

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