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Treating Employees Like Widgets: The Legal Impact of Workforce Management Systems on Contingent Workers

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Recommended Citation

Brody, Stefanie, "Treating Employees Like Widgets: The Legal Impact of Workforce Management Systems on Contingent Workers" (2018). *Louis Jackson National Student Writing Competition*. 59.
https://scholarship.kentlaw.iit.edu/louis_jackson/59

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**TREATING EMPLOYEES LIKE WIDGETS:
THE LEGAL IMPACT OF WORKFORCE MANAGEMENT SYSTEMS ON CONTINGENT WORKERS**

I. INTRODUCTION

When a large clothing retailer first launched its computer-algorithmic workforce management system nationwide, it was viewed by many as a harbinger of dehumanization—both of the managerial process and of employees, who became pieces in a profit-minded puzzle rather than individuals.¹ Naturally, the workforce management system industry leaders saw things differently, presenting the high-powered modeling tools as solutions to the growing just-in-time economy with its unpredictable supply and demand fluctuations, which have contributed to employers needing their businesses to be able to adapt quickly to continuous change.² Workforce management systems do give employers that ability, with high-tech, number-crunching programs able to alert them to shifts in demand requiring shifts in employee scheduling on a moment's notice. But the impact on workers is serious, such as for the low-wage, part-time employee who has taken a 50-minute bus ride to get to her mall retail job, arriving just in time for her boss to say business has been slow and her hours for that day were cut. The employee goes home, where she has already paid for childcare for the afternoon and is not able to get any extra hours at her second gig. Maybe next week will be better, but there is no way to be sure until the schedule for Monday gets posted...Sunday.

This scenario illustrates a disconnect between the flexibility for which the demand economy is heralded compared to the reality faced by many American workers in just-in-time scheduled, low-wage jobs, where the benefits of flexible scheduling are unilaterally enjoyed by

¹ Vanessa O'Connel, *Retailers Reprogram Workers In Efficiency Push*, WALL STREET JOURNAL (Sept. 10, 2008), <https://www.wsj.com/articles/SB122100270555417001> (describing the launch of Ann Inc.'s management system, Ann Taylor Labor Allocation System ("ATLAS")).

² SANDRA E. GLEASON, *THE SHADOW WORKFORCE PERSPECTIVES ON CONTINGENT WORK IN THE UNITED STATES, JAPAN, AND EUROPE* 307 (Upjohn Institute eds., 2006).

the employer. When workforce management systems remove employee control and devalue the human element of the work performed, the employee becomes an invisible cog in machine driven not by bosses but by algorithms.³

In this paper, I use commodification theory to examine workforce management systems' effect on contingent workers in retail. First, I introduce commodification theory, and its anti-commodification counterpoint, as a framework for conceptualizing how workforce management systems play a role in invisible labor commodification. Then, I provide background on scientific management in the workplace, from its origins in manufacturing to its new home in modern day retailing. I give an overview of the current research literature on algorithmic models of workforce management systems and how they can be designed to aggravate or solve the contingent worker scheduling problem.⁴ In the analysis section, I apply these labor theories to just-in-time workforce management systems and discuss their social and legal ramifications. Finally, I offer a solution that seeks to leverage the positive qualities of workforce management systems and their ability to handle large amounts of data and quickly generate schedules that optimize input factors. Specifically, I propose that employers should introduce employee-friendly variables inspired by predictive, secure scheduling ordinances into the workforce

³ Sarah O'Connor, *When your boss is an algorithm*, FINANCIAL TIMES (Sept. 10, 2016), <https://www.ft.com/content/88fdc58e-754f-11e6-b60a-de4532d5ea35>.

⁴ Audrey Freeman is attributed the first use of the phrase "contingent workers" in 1985 "to refer to employees whose work is contingent on the variability of the employers' need for them." M. Catherine Lundy et al., *Union Responses to Challenges of Contingent Work Arrangements*, in SANDRA E. GLEASON, *THE SHADOW WORKFORCE PERSPECTIVES ON CONTINGENT WORK IN THE UNITED STATES, JAPAN, AND EUROPE* 307 (Upjohn Institute eds., 2006). Within that framework, this paper focuses on just-in-time scheduling, which is distinguishable from on-demand, gig scheduling where workers and projects are connected in real-time through networks such as Upwork, Freelancer, Fiverr, WorkPup, among others. Josh Bersin, *Transformative Tech: A Disruptive Year Ahead, the principal and founder of Bersin by Deloitte, Deloitte Consulting LLP, shares 9 trends that are shaking up the HR tech market in 2017*, HR MAG. 29, 30 (Feb. 2017). On-demand scheduling presents additional challenges. See Valerio De Stefano, *The rise of the "just-in-time workforce": On-demand work, crowdwork and labour protection in the "gigeconomy"*, INTERNATIONAL LABOUR OFFICE-GENEVA, *Conditions of Work and Employment Series* No. 71 (2016).

management systems. By bringing employee-friendly variables to the equation to offset the demand and output constraints, the algorithm would reify the workers and bring back the human element of work.

II. BACKGROUND

A. *Commodification Theory: Work and Workers as Commodities and the Dignity of Labor*

Commodification of labor is a Marxist-based framework for conceptualizing labor as a commodity to be bought and sold.⁵ This economic model is rooted in the idea of work as a quantifiable input-output variable that employers and employees both seek to optimize. While workers provide varying amounts of work to earn income and maximize household utility—which Marx called “labor power”—employers “maximize their profits by utilizing the optimum amounts of labor, capital, and other inputs to produce goods and services for sale.”⁶ In that way, “diverse forms of concrete labor are all reduced to sources of economic value that can be made equivalent by exchanging them at an appropriate set of relative prices,”⁷ such that labor is recoded as a commodity.⁸ For example, the market determines the going wage rate, which becomes one factor within the larger decision about how to allocate hours and pay. In the employer’s pursuit of efficient optimization, “[w]ork and workers are thus treated like any other factor of production... governed by impersonal ‘laws’ of supply and demand.”⁹

⁵ John W. Budd, *The Eye Sees What the Mind Knows: The Conceptual Foundations of Invisible Work*, in *INVISIBLE LABOR* 28, 33 (Marion G. Crain, Winfred R. Poster, & Miriam A. Cherry eds., 2016) (defining concept of work as a commodity) [hereinafter Budd, *Invisible Work*].

⁶ John Budd, *Theorizing Work: The Importance of Conceptualizations of Work for Research and Practice* 3 (24th Cardiff Employment Research Unit Annual Conference, Working Paper, 2010) [hereinafter Budd, *Theorizing Work*].

⁷ *Id.* at 3.

⁸ A. Aneesh, *Algoocratic Modes of Organization*, 27 *SOC. THEORY* 347, 365-66 (2009).

⁹ Budd, *Invisible Work*, *supra* note 5, at 33-34.

Commodification of labor “neutralized the lifeworld context of labor by rendering it abstract”¹⁰—even invisible. In describing the implications of commodification on invisible labor, Budd (2016) identified the devaluation of labor as a form of invisibility and postulated that “[w]ork should not be narrowly seen solely as a commoditized economic transaction that provides income but instead should be robustly visible as a fully human activity.”¹¹ For instance, if work is defined as creating economic value, then “[u]npaid household work, indigenous activities like hunting, and other nonmarket forms of work are therefore dismissed” and not considered work.¹² Additionally, compensation becomes integral to defining work: “[l]owly paid work is therefore devalued and rendered less visible than highly paid work.”¹³ Work as a commodity has been proclaimed as a natural product of the free market, but that notion clashes with the important idea of “work as personal fulfillment and identity” because it “puts work beyond our control” and subject instead only to market forces.¹⁴

Budd and other scholars of employment relations and advocate against the commodification of labor for both normative and analytical reasons.¹⁵ When labor is treated like any other commodity, workers are viewed through an obscure economic lens to the exclusion of all concerns, including human agency and dignity.¹⁶ Unlike inanimate commodities, humans

¹⁰ Aneesh, *supra* note 8, at 366.

¹¹ Budd, *Invisible Work*, *supra* note 5, at 45. *See generally* JOHN W. BUDD, *EMPLOYMENT WITH A HUMAN FACE: BALANCING EFFICIENCY, EQUITY, AND VOICE* (2004).

¹² *Id.* at 41.

¹³ *Id.*

¹⁴ *Id.* at 42, 44.

¹⁵ Budd, *Theorizing Work*, *supra* note 6, at 3-4.

¹⁶ *Id.* *See also* Dr. Martin Luther King, Jr., *Speech for the American Federation of State, County and Municipal Employees (AFSCME)*, Memphis, TN (March 18, 1968) in *ALL LABOR HAS DIGNITY* 171 (MICHAEL K. HONEY ED., 2011) (in which Dr. King addressed an African American community preparing to strike: “You are demanding that this city will respect the dignity of labor...[W]henever you are engaged in work that serves humanity and is for the building of humanity, it has dignity, and it has worth. One day our society must come to see this.”)

“require fairness, voice, security and work of consequence to make their maximum contributions to real efficiency.”¹⁷ This is exacerbated by the fact that commodification theory presumes a perfectly competitive market, yet the reality is an imperfect market in which the relationship between employer and employee is imbalanced. Such imbalance in favor of the employer can produce detrimental social and economic effects, such as low wages that depress consumer purchasing power and in turn destabilize the market and create conditions of poverty.¹⁸ While just-in-time scheduling may appear efficient at first blush, it creates negative externalities by shifting the true costs and risks of doing business onto employees, which can lead to the employers acting *inefficiently* without having to bear the full brunt of their choices.¹⁹ Given the imperfect market, workers must therefore be guaranteed certain rights and fair labor standards through market-external regulations.²⁰ Because people are not goods, “human dignity demands some workplace practices yield.”²¹ Through such regulations, the competing interests of employers and employees can be balanced to promote healthy competition that “supports both freedom and optimal economic and social outcomes.”²²

One organization that has addressed this subject is the International Labour Organization (“ILO”). In its efforts to recognize workers’ rights as human rights, the ILO expressly rejected labor commodification in its 1944 Declaration of Philadelphia and continues to promote

¹⁷ John Budd, *Achieving Decent Work by Giving Employment a Human Face* 8 (InFocus Programme on Social Dialogue, Labour Law and Labour Administration, INTERNATIONAL LABOR OFFICE, Working Paper, 2004) [hereinafter Budd, *Achieving Decent Work*].

¹⁸ *Id.* at 3.

¹⁹ Alexander et al., *Stabilizing Low-Wage Work*, 50 HARV. CIVIL RIGHTS L. REV. 1, 33-33 (2015).

²⁰ Budd, *Theorizing Work*, *supra* note 6, at 4.

²¹ Alexander et al., *supra* note 19, at 33.

²² Budd, *Achieving Decent Work*, *supra* note 17, at 3.

standardized protections for workers around the world.²³ In its Fundamental Principles and Rights at Work declaration, the ILO proclaims that guaranteeing worker protections is important for balancing economic and social progress because it enables people to enjoy their “fair share of the wealth which they have helped to generate, and to achieve fully their human potential.”²⁴ From the invisible labor perspective, when workers are invisible in the market, so too are their rights. Part of rejecting labor commodification is declouking workers’ claims to fair compensation and freedom from discrimination, among other rights enumerated by the ILO.

Commodification theory is “sensitive to the role of technology in bringing core human attributes within the ambit of market exchange.”²⁵ Workforce management systems illustrate labor commodification’s lack of control and devaluation as a form of invisibility. Workforce management systems visually embody the idea of labor as a commodity by removing the human element from employee scheduling, making the human part of the work invisible as employers “drag and drop” workers into slots to optimize profits. It is a “liquefaction of concrete labor into [invisible] digital code.”²⁶ Within these complex and pervasive programs, just as work itself “is thought of as a generic input into a production function,” so too are the workers.²⁷

²³ See De Stefano, *supra* note 4; see DECLARATION OF PHILADELPHIA, INT’L LABOUR ORG. (1944), http://blue.lim.ilo.org/cariblex/pdfs/ILO_dec_philadelphia.pdf.

²⁴ DECLARATION ON FUNDAMENTAL PRINCIPLES AND RIGHTS AT WORK, INT’L LABOUR ORG., Eighty-sixth Session of the International Labour Conference, Geneva (June 18, 1998, Annex revised 15 June 2010), http://www.ilo.org/wcmsp5/groups/public/---ed_norm/---declaration/documents/publication/wcms_467653.pdf.

²⁵ Julian Dibbell, *Invisible Labor, Invisible Play: Online Gold Farming and the Boundary Between Jobs and Games* 18 VAND. J. ENT. & TECH. L. 419, 463 (2016).

²⁶ Aneesh, *supra* note 8, at 367.

²⁷ Budd, *Invisible Work*, *supra* note 5, at 33. Not all commodification of contingent workers is deliberate. In contrast, a key problem is that “organizations are not always aware of the competencies of their employees, thus are not able...to ensure knowledge processes and efficiency.” E. Gourova, et al., *Knowledge Profiles of Employees* (EuroPLoP, Working Paper, 2016) (discussing knowledge management systems and how to account employee knowledge that is not easily quantifiable).

B. *Workforce Management Systems as Scientific Management of the Scheduling and Timing of Work*

1. *From Factory Floor to Department Store: Scientific Management in American Retail*

One framework for comprehending the role of workforce management systems is scientific management. Scientific management involves systematically dividing jobs into discrete components to centralize control over the labor process and increase profits.²⁸ Understanding of the history of scientific management practices in the United States (“U.S.”) elucidates the current role workforce management systems play in employment relationships and in rendering employees invisible within their algorithmic programs.

The scientific management movement, also known as Taylorism, derives from Frederick Taylor’s (1911) *The Principles of Scientific Management*.²⁹ In order to enhance efficiency, and consequently profitability, Taylor proposed taking workers’ knowledge and using it to replace ad hoc discretion over daily tasks with a series of organizational methods and best practices.³⁰ Taylor’s principles were most notably put into practice by Henry Ford and other manufacturers in the early twentieth century, particularly with task segmentation and planning separated from execution.³¹ Taylor envisioned applying his principles “beyond the factory floor” to other activities,³² and one area to which it disseminated was retail.³³ The 1920s and 1930s saw “a period of significant transformation in managerial practice” in retail as American department

²⁸ Marion Crain, *The Kenneth M. Piper Lecture: 2002-2003: The Transformation of the Professional Workforce*, 79 CHI.-KENT L. REV. 543, 555 (2004) (discussing devaluation in professional work).

²⁹ See generally FREDERICK W. TAYLOR, *THE PRINCIPLES OF SCIENTIFIC MANAGEMENT* (New York: Harper, 1911).

³⁰ Martha Crowley et al., *Neo-Taylorism at Work: Occupational Change in the Post-Fordist Era*, 47 SOC. PROBS. 421, 422 (2010); Ingrid Jeacle, *Emporium of glamour and sanctum of scientific management: the early twentieth century department store*, 42 J OF MGMT. HIST. 1162, 1163 (2004).

³¹ Crowley et al., *supra* note 30, at 423.

³² Jeacle, *supra* note 30, at 1164.

³³ *Id.* at 1172-73.

stores like Macy's of New York and Marshall Fields of Chicago began incorporating Taylor's scientific management principles in the hopes of bringing efficiency to "an increasingly complex distributive system."³⁴ The first areas to be Taylorized were organizing pricing schemes and regulating inventory as well as introducing credit buying to customers and controlling internal overhead costs.³⁵ Management became powerfully centralized, rather than left to the discretion of individual departments, and retail began to look more like it does today where "crucial authority [is] invested in budgetary forecasts and inventory tracking systems."³⁶ Other current scientific management techniques include intelligent scheduling of part-time employees, statistical quality control, and projection management.³⁷

Many scholars caution scientific management can be problematic in its implementation. For instance, Crain (2004) discussed how scientific management strips workers of autonomy in controlling the process of work. Specifically, management directs employee tasks at the micro-level, "specifying each day what tasks are to be done, the way in which they should be done, and the time allotted for completing them. Workers thus lose control over the content of their work, its pace, and the manner in which it is performed."³⁸ Furthermore, while Taylorism called for using employee innovation continuously to improve managerial methods, Crowley et al. (2010) pointed out that "Fordism" discounted the workers' input by treating them as interchangeable parts rather than "capable of contributing valuable ideas."³⁹ Crowley et al. (2010) have perceived

³⁴ *Id.* at 1163, 1165.

³⁵ *Id.* at 1167.

³⁶ *Id.* at 1173.

³⁷ Mohan, *infra* note 116, at 1806.

³⁸ Crain, *supra* note 28, at 556.

³⁹ Crowley, *supra* note 30, at 426 (noting that Taylor did not fully explain how to cycle in new worker innovations to improve productivity).

a revitalization of scientific management in all sectors, including service and lower white-collar work, towards a renewed focus on flexibility and efficiency.⁴⁰ The authors argued that “employers’ pursuit of flexibility has eroded security among workers.”⁴¹ The authors’ concern about unilateral benefits of flexibility of management styles is paralleled by the flexibility asymmetry of just-in-time scheduling.

Analogous to the negative impact of Fordism of manufacturing management on worker autonomy, workforce management systems are a type of “algocracy”⁴² or “algorithmic management”⁴³ that apply to the *scheduling and timing* of work, with a similar potential for limiting worker autonomy. Scientific management “purports to subject workers and employers to the objective laws of science rather than to the arbitrary whims of human beings.”⁴⁴

When the Ann Taylor Labor Allocation System (“ATLAS”) management system was implemented at Ann Taylor stores, one human resource manager commented that “there is a natural resistance” to submitting to a computer algorithm proxy for a manager, but “[w]hen you have those clear methods of measurement, and just-in-time delivery for supply-chain management, it’s a natural transition to apply it to human resources as well.”⁴⁵ When the computer is in charge, rather than an individual, Aneesh (2009) describes the phenomenon as “algocratic management.” The idea is that there are “programming schemes embedded in software platforms...[that] structure forms of work performance [and] enable[] the monitoring of

⁴⁰ Crowley et al., *supra* note 30, at 423 n3.

⁴¹ *Id.* at 421.

⁴² Aneesh, *supra* note 8.

⁴³ O’Connor, *supra* note 3 (“The term ‘algorithmic management’ was coined...by academics at the Carnegie Mellon University Human-Computer Interaction Institute, and it is this innovation, they argue, that makes the gig economy possible.”).

⁴⁴ Crain, *supra* note 28, at 556.

⁴⁵ O’Connel, *supra* note 1.

work through the design of the work process itself.”⁴⁶ The notion of algocracy reflects how the computer substitutes as a manager at the level of coding because it presets the choices the user can select.⁴⁷ With modern computerization, nearly any kind of knowledge held by an employee can be encoded—hence Taylorized—into algocratic management programs:

The ability to break down, digitize, and then recode into a program a tax accountant’s knowledge and skills, a civil engineer’s mathematical and visual conception of a three-dimensional structure, an architect’s drawing skills, and some managerial skills (e.g., probabilistic decision making) enhances the potential for rearranging elements of work in different configurations.⁴⁸

In this way, computers empower employers to further divorce worker innovation from work.⁴⁹

For just-in-time scheduling, the workforce management systems can establish “technocratic control” for employers over “the flexibility and coordinating features necessary to facilitate work.”⁵⁰

2. *The Scheduling of Just-in-Time Work*

Contingent workforce management systems consist of programs employers use to schedule employees for task-oriented shifts based on constantly updated sales data. Some systems are designed to schedule employees working onsite, such as for large retail businesses, which comprises the focus of this paper. Other systems are designed to schedule virtual

⁴⁶ Aneesh, *supra* note 8, at 349.

⁴⁷ This is especially critical for successful coordination among global employees in virtual gig work, where people cannot meet face-to-face but instead rely on a uniform coding program. *Id.* at 353, 356.

⁴⁸ *Id.* at 366.

⁴⁹ On the flip side, Huws (2011) suggests this also introduces Taylorism of the *consumer*. Urusula Huws, *Labor and Capital, Gender and Commodification*, in SASHA LILLEY, *CAPITAL AND ITS DISCONTENTS: CONVERSATIONS WITH RADICAL THINKERS IN A TIME OF TUMULT* 165, 168-60 (2011). Just as employees are locked into programmed forms and operations, such as for call center workers, the consumer making the call must also acclimate to preset options, such as pressing specific menu buttons and being prepared to hear that “your call is very important to us, please hold.” “The act of being a consumer has increasingly been reduced to effectively filling in forms...remember[ing] passwords and pin numbers...just as Taylorized as if you were the employee but you aren’t even paid for it.” *Id.*

⁵⁰ Tali Kristal, *The Capitalist Machine: Computerization, Workers’ Power, and the Decline in Labor’s Share within U.S. Industries*, 78 AM. SOC. REV. 361, 369 (2013).

employees, assigning work based on immediate demand.⁵¹ The industry as a whole is self-described as “human-capital management” and is a multi-billion dollar industry.⁵² The systems have been very popular and widely implemented in the last several decades in the U.S. and other nations, particularly in retail, where “retailers fight to improve productivity and cut payroll costs,” with subscribers including Gap, Inc., Wal-Mart Stores Inc., Williams-Sonoma, Inc., GameStop Corp, and countless more.⁵³ Workforce management systems aim to handle on-demand data and implementation through software vendor management and time-tracking and scheduling systems, and some of the key industry leader industry leaders are Fieldglass from SAP, Workday, Beeline, PeopleFluent, Oracle Corp., and Kronos.⁵⁴

Kronos, for example, advertises its workforce management system as a solution to the “time-consuming, error-prone and downright frustrating” process of personnel scheduling using spreadsheets and semi-automated systems, which “too often results in overstaffed shifts, shorthand rushes, excessive over, employee disengagement, and even [regulatory] compliance issues.”⁵⁵ Indeed, workforce management system vendors generally claim their systems can boost productivity by fifteen percent and reduce labor costs by five percent.⁵⁶ The Kronos Workforce Ready® Scheduler “automatically generates best-fit schedules based on [an] organization’s unique requirements to help control labor costs, minimize compliance risk, improve productivity, and drive employee engagement.”⁵⁷ It accomplishes this by “sort[ing]

⁵¹ See *supra* note 4.

⁵² O’Connell, *supra* note 1.

⁵³ *Id.*

⁵⁴ Bersin, *supra* note 4, at 34.

⁵⁵ KRONOS WORKFORCE READY® SCHEDULER DATASHEET, <https://www.kronos.com/products/workforce-ready-suite/workforce-ready-scheduler> (last visited March 22, 2017).

⁵⁶ O’Connell, *supra* note 1.

⁵⁷ KRONOS, *supra* note 55.

through employees based on predefined criteria” and assigning them to positions that “aligns staff coverage with known demand or calculated workload.”⁵⁸ While Kronos can be implemented in many industries, the Ann Taylor’s ATLAS program provides an example of a workforce management system tailored to a specific corporation.⁵⁹

For the computer scientists programming the workforce management systems, employee scheduling, more accurately termed shift scheduling, “is defined as a problem of placing resources (employees) into slots in a pattern, in such a way to accomplish given constraints.”⁶⁰ The constraints are based on optimizing a business’s responses to changes in demand in real-time as well as based on historic patterns of demand if available. Workforce management systems in this way are a proactive and tactical mechanism for scheduling workers in a way that can “absorb unexpected events or improve adjustment ability.”⁶¹ Because there is uncertainty in contingent labor, businesses must be “proactive and reactive...to deal with actual demand and employee availability.”⁶²

There are many approaches to the scheduling problem, and within the existing literature the algorithmic models are most commonly applied to industrial organizations, shopping centers, call centers, toll booths, and hospitals.⁶³ Although workforce scheduling is a regular managerial activity in retail stores, there has been less research on building optimal workforce scheduling

⁵⁸ *Id.*

⁵⁹ O’Connel, *supra* note 1.

⁶⁰ Adrian Brezulianu et al., *A genetic algorithm approach for a constrained employee scheduling problem as applied to employees at mall type shops*, INT’L CONF. ON CONVERGENCE & HYBRID INFO. TECH. 497, 497 (2009) (experimenting with a genetic algorithm approach to the scheduling problem as applied to a small retail shop).

⁶¹ Jonas Ingels & Broos Maenhout, *Employee substitutability as a tool to improve the robustness in personnel scheduling*, SPECTRUM 1, 4 (2017).

⁶² *Id.* at 4.

⁶³ Brezulianu et al., *supra* note 60, at 497.

models for retail stores than the other listed areas.⁶⁴ Also, most modeling studies have been done for large businesses, in part because the smaller the data pool the bigger the impact of one minor change, making it harder to optimize the schedule.⁶⁵ The scheduling process is typically conceived in four steps: (1) forecasting demand; (2) determining staffing requirements in order to meet a specific minimal cost performance target; (3) scheduling shifts based on the staffing requirements; and (4) assigning employees to shifts.⁶⁶ When trying to optimize scheduling through those four steps, the algorithmic model is designed to balance staffing requirements and scheduling requirements, which do not always match up and can negatively affect business costs.⁶⁷ Changes in demand “from shifts in buying power, consumer preferences, and competition” may increase or reduce the staffing requirements, and consequently increase or reduce the need for workers.⁶⁸

In a comprehensive review of existing modeling approaches to the scheduling problem that demonstrate success in handling numerous parameters, Defraeye and Nieuwenhuys (2015) identified three types: (1) two-step approaches, which start with staffing requirements and then apply those requirements to scheduling, and which is the most common; (2) feedback-based approaches, which address staffing and scheduling simultaneously, using “the concept of staffing requirements to fit shift requirements in an iterative manner,” with a feedback loop between staffing and scheduling; and (3) direct approaches, which do not take into account staffing

⁶⁴ Dingding Lin et. al., *Scheduling Workforce for Retail Stores with Employee Preferences*, IEEE INT’L CONF. SERV. OPERATIONS, LOGISTICS, & INFORMATICS 37, 37 (2015).

⁶⁵ Mieke Defraeye & Ineke Van Nieuwenhuys, *Staffing and scheduling under nonstationary demand for service: a literature review*, 58 OMEGA 4, 20 (2015).

⁶⁶ *Id.* at 5.

⁶⁷ *Id.* at 17.

⁶⁸ Douglas J. Miller & Jay B. Barney, *Employer Perspectives: Competing through a Flexible Workforce*, in SANDRA E. GLEASON, THE SHADOW WORKFORCE PERSPECTIVES ON CONTINGENT WORK IN THE UNITED STATES, JAPAN, AND EUROPE (Upjohn Institute eds., 2006).

requirements but rather “construct shift schedules directly based on the non-stationary demand [that is, from arrival rates like people showing up at an emergency center or calls coming in at a call center], without using the concept of staffing requirements” such that “the solution space is less contained.”⁶⁹ Discussing the pros and cons of each, the researchers found most of the studied models make too many assumptions, like presuming homogeneity of customers, thereby lacking a “real-life implementation.”⁷⁰ For the most demand-responsive models, such as the feedback-based approach, in which updated staffing and scheduling data are jointly dealt with in layered steps, the iterations keep going “until a satisfactory (not necessarily optimal) solution is found.”⁷¹ But sometimes the models do not end up solvable and have to be simplified to produce any schedule at all.⁷² Even successful algorithms are not necessarily error-free. In one typical study, in which a “genetic-based” algorithmic approach using chromosome encoding was applied to employee scheduling at a retail store, the employees were entered into the system with “all pertinent information,” which included their employee identification number, name, department, availability, and employee selected options for two off days per week.⁷³ The main idea behind the simple parameters in retail scheduling algorithms is to match worker type with staffing need, such as ensuring sales floor workers are assigned to the sales floor and not payroll, to which only managerial department employees can be assigned. While there was some margin of error, it was not significant, and the algorithm successfully generated an optimal schedule.

⁶⁹ Defraeye & Nieuwenhuyse, *supra* note 65, at 16-17.

⁷⁰ *Id.* at 20.

⁷¹ *Id.* at 17.

⁷² *Id.*

⁷³ Brezulianu, et al., *supra* note 60, at 498.

For just-in-time work, shift scheduling of contingent workers presents a complex, scientific problem for which there are many algorithmic approaches. As technology continues to improve, each new approach is better able to accommodate more data, and more *realistic* data, than the next.

III. ANALYSIS OF JUST-IN-TIME SCHEDULING AND A PROPOSAL FOR INTRODUCING EMPLOYEE-FRIENDLY PROGRAMMING INTO WORKFORCE MANAGEMENT SYSTEMS

While workforce management systems at their best can optimize work for increased efficiency and profit, at their worst these scheduling systems can create problems for workers with unpredictable scheduling and income as well as overall job instability, which in turn affects the greater community and results in legal uncertainties. To address these concerns while recognizing the pervasiveness of workforce management systems, employers should build employee-conscious constraints into the algorithmic models. This would remove the employee from the commoditized spectrum of invisible labor and bring them back into the equation, which is important under the anti-commodification theory framework provided by Budd (2016), according to which “[w]ork should not be narrowly seen solely as a commoditized economic transaction that provides income but instead should be robustly visible as a fully human activity.”⁷⁴ Moreover, this not only would increase employee satisfaction and reduce turnover but also alleviate some of the legal policy concerns concerning unfair burdens on contingent workers in society.

A. *Contingent Worker Scheduling Challenges*

The rise of the contingent workforce is associated with globalization, deregulation of labor markets, and rapid technology advances as well as the desire for more flexibility by both

⁷⁴ Budd, *Invisible Work*, *supra* note 5, at 45.

employers and employees.⁷⁵ Just-in-time scheduling is one of “many cost-cutting strategies that service sector employers have adopted as the economy has worsened, including converting formerly full-time jobs to part-time” and using more contingent labor.⁷⁶ For nonstandard labor to be successful, the desired flexibility cannot be unilaterally benefiting employers at the expense of employees. Rather, “the need is for flexibility and efficiency while treating all employees equitably,” or in other words, “a more humane model of flexibility.”⁷⁷ While “technology has streamlined the scheduling process... companies are tasked with creating a system that is fair to both the employees and the customers.”⁷⁸ This call for fairness in scheduling echoes throughout the existing research on scheduling contingent workers.⁷⁹ Furthermore, treating workers as visible humans and not as commodities is necessary for workers’ “psychological health as well as for the quality of democracy and other social relations.”⁸⁰ Lambert and Henly (2009) report that “[h]ourly workers increasingly experience fluctuating and reduced work hours and unpredictable work schedules that can compromise their job performance and their ability to earn an adequate living. Local communities suffer when residents’ jobs are unstable and their earnings unpredictable.”⁸¹ Workforce management systems in retail, for example, can produce nonsensical hours that leave workers unable plan beyond the next week—making planning for

⁷⁵ GLEASON, *supra* note 2, at 307.

⁷⁶ Alexander et al., *supra* note 19, at 4-5 (2015).

⁷⁷ GLEASON, *supra* note 2, at 322.

⁷⁸ Maya Sweedler, *Making scheduling fair for employees and customers*, PITTSBURGH POST-GAZETTE (Aug. 18, 2016), <http://www.post-gazette.com/topworkplaces2016/2016/08/18/Departmentalization-simplifies-scheduling/stories/201607150010>.

⁷⁹ *Id.*; Alexander et al., *supra* note 19.

⁸⁰ Budd, *Invisible Work*, *supra* note 5, at 45.

⁸¹ Susan J. Lambert & Julia R. Henly, *Scheduling in Hourly Jobs: Promising Practices for the Twenty-First Century Economy*, MOBILITY AGENDA, 1, 4 (May 2009) (“Common scheduling practices in hourly jobs create challenges for workers, employers, and communities alike.”).

childcare difficult and similarly making it difficult to hold multiple jobs, which is often necessary to maintain a living wage.

There is a disconnect between what seems optimized from a commodification standpoint and the actual lived experience of the worker and manager. Lambert and Henly (2009) comment that improvements often look better on paper (or in this case, the computer screen) than in practice. For instance, “accountability requirements that compel supervisors in retail stores to check labor-to-sales ratios hourly or daily and to make ongoing adjustments to staffing levels make it difficult to prepare work schedules at all, let alone with longer advance notice,” resulting in scheduling unpredictability for workers and frustration for managers seeking to fill the required shifts.⁸²

Furthermore, “[w]ork hours—and the schedules and wages attached to them—have become a key source of inequality among workers over the past forty years.”⁸³ Among the problems identified by Jacobs and Padavic (2015) for low-income, contingent working women in the U.S., scheduling was at the top of the iceberg, with workers highly antagonistic toward “being assigned erratic and unpredictable hours.”⁸⁴ In their study of seventeen contingent, racially diverse working women in low-wage service jobs in mid-sized cities in the southeastern U.S., Jacobs and Padavic found several main areas of concern that called for more employee-friendly work policies: unpredictable work schedules, inadequate hours, time theft, punishment-and-control via hours-reduction, as well as a negative impact on family life.⁸⁵ The contingent

⁸² *Id.* at 12.

⁸³ Anna W. Jacobs & Irene Padavic, *Hours, Scheduling and Flexibility for Women in the US Low-Wage Labour Force*, 22 *GENDER, WORK & ORG.* 67, 81 (2015).

⁸⁴ *Id.* at 75.

⁸⁵ *Id.* at 68, 73.

workers described their precarious employment as “bad jobs” because they had no promise of continued employment, were not paid well, and were involuntarily part-time.⁸⁶ Given that retailers do not cater to the needs of employees but rather hire a stream of replaceable entry-level workers, the low-paying “flexible” jobs offer the *least* flexibility.⁸⁷ One older worker who had worked at the same grocery store for fifteen years commented on the flexibility asymmetry implemented through the workforce management system:

They have these tracking systems on the computer. They actually can track sales, availability of products, and the hours people are working to the actual time when we are needed the most. So I literally will have a shift from 11:15 to 3:45—crazy little weird shifts. It used to be that the manager decided your hours, and you could give your input. But now it’s the computer. It has a mind of its own.⁸⁸

That anthropomorphizing and distrust of workforce management scheduling systems is ubiquitous, and employers are aware of it—and even use it to their advantage. When Ann Taylor implemented ATLAS, a company representative explained, “Giving the system a nickname, Atlas...was important because it gave a personality to the system, so [employees] hate the system and not us.” To hide behind the algorithm, itself programmed with the employer’s specifications, is a serious accountability gap. An employee complained that ATLAS “dehumanized the managerial process,” because where you used to be able to speak with a manager and work things out, the new system did not allow for that, nor was it programmed to recognize seniority among employees or to acknowledge that workers were having to make long commutes for paltry three-hour shifts.⁸⁹

⁸⁶ *Id.* at 68. In another example, just because retail workers may sometimes be allowed to set their own availability does not mean they will actually be scheduled to work, highlighting a potential need for guaranteed minimum hour requirements. Lambert & Henly, *supra* note 81, at 12.

⁸⁷ Jacobs & Padavic, *supra* note 83, at 72.

⁸⁸ *Id.* at 75.

⁸⁹ O’Connel, *supra* note 1.

In Jacobs and Padavic’s (2015) study, unpredictable schedules were found to correlate with financial insecurity; not only did the women often receive too few hours to earn a living wage, the constantly fluctuating schedule kept them from having second jobs to supplement their income.⁹⁰ Additionally, “last minute scheduling creates worse havoc for women [especially mothers] on the edge of poverty who have fewer financial resource sot cushion the blow of a schedule change.”⁹¹ Other issues included time theft—whereby the employer used strategies like extending unpaid breaks to coerce unpaid work—as well as punishment-and-control via hours-reduction—such as cutting an employee’s hours if she was late, underperformed, or irritated the manager.⁹² With respect to the unilateral flexibility experienced by these workers, hours reduction was also used a punishment for asking for minor scheduling accommodation.⁹³ Here, then, “hiring people, inserting them into job slots, and setting their wages and hours, are the mechanisms that produce inequality regimes.”⁹⁴ Unpredictable scheduling is currently legal throughout the U.S.,⁹⁵ and unchecked is creating a need for some sort of change—be it regulatory or within the business practices themselves.

B. Using Workforce Management Systems to Address Worker Scheduling Challenges

1. Other Proposed Solutions: Predictive Scheduling Laws

Among recommendations that have been made, Lambert and Henly (2009) propose “[s]everal targets for intervention—ranging from improving employer scheduling practices to

⁹⁰ Jacobs & Padavic, *supra* note 83, at 76.

⁹¹ *Id.*

⁹² *Id.* at 76-79.

⁹³ *Id.* at 79.

⁹⁴ *Id.* at 82.

⁹⁵ *But see infra* § III(B)(1) (discussing the predictable scheduling ordinances in Seattle, Washington and San Francisco and Emeryville, California).

enacting new legislation—[that] could enhance the quality of jobs for hourly workers and, in turn, the quality of life in families and local communities.”⁹⁶ As anticipated by anti-commodification advocates, market pressure has had meager success in curbing the tide of unpredictable just-in-time scheduling. A handful of employers in the retail industry found that truly optimized labor was not worth other costs: namely, social outcry.⁹⁷ This suggests that not all industries are suited to adopt a system of fully responsive on-demand labor, even if workforce management systems make them feasible. For legislative solutions, there has been action on the federal, state, and local levels.

The U.S.’s “main legal mechanism” for wage and hour regulation, the Fair Labor Standards Act (“FLSA”), does not reach the just-time-time scheduling issues facing part-time contingent workers.⁹⁸ While it guarantees a minimum wage and has overtime and on-call time provisions, it does not address minimum hours requirements or regulate the manner in which employers schedule their employees.⁹⁹ If the FLSA were expanded to cover secure scheduling, it would “recognize the new realities of the American workplace and would comport with the FLSA’s statutory purpose of protecting workers against exploitive employer policies and practices.”¹⁰⁰ Also in the federal arena, in July 2015, Senator Elizabeth Warren sponsored twin bills called the Schedules That Work Act (114th Congress, H.R. 3071, S. 1772) that called for

⁹⁶ Lambert & Henly, *supra* note 81, at 12 (arguing that public policies should be modified to fit scheduling practices in hourly jobs). *Also see* Catharine Morisset, *The Unpredictability Of Seattle’s Proposed Predictable Scheduling Law*, MONDAQ BUS. BRIEFING (Sept. 13, 2016) (explaining Seattle’s “Secure Scheduling Ordinance,” which set new guidelines for scheduling requirements and gave employees protection from retaliation through employer penalty fines).

⁹⁷ *Six retailers agree to stop using on-call shift scheduling*, LA TIMES (Dec. 6, 2016, 1:20 PM), <http://www.latimes.com/business/la-fi-retailer-scheduling-20161220-story.html>.

⁹⁸ Alexander et al., *supra* note 19, at 5; The Fair Labor Standards Act of 1938, As Amended, 29 U.S.C. 201-219.

⁹⁹ Alexander et al., *supra* note 19, at 5.

¹⁰⁰ *Id.* at 35-36.

stable, predictive scheduling.¹⁰¹ Although the act did not move forward, it did spark similar action at the state and local levels. As it stands, federal law leaves a gap in federal protection for just-in-time workers.

The type of legislation gaining the most traction thus far is predictive, or secure, scheduling. Predictive scheduling aims to increase the predictability of scheduling for part-time workers, primarily in the food and retail service industries, by requiring employers to follow set procedures for just-in-time schedule changes and compensation. Standards include requiring advance notice of scheduling, paying employees for last-minute schedule changes, and expanding guaranteed pay provisions (termed “predictability pay”) to cover more on-call employees.¹⁰² Three cities have passed predictive scheduling ordinances—Seattle, Washington and San Francisco and Emeryville, California—and others are considering enacting such legislation, like Washington, D.C., New York City, and Albuquerque, New Mexico. San Francisco was the first to enact its Retail Workers’ Bill of Rights ordinance in 2015,¹⁰³ which required retail employers to provide schedules two weeks in advance and which directed employers to remunerate predictability pay for unexcused, last-minute scheduling cuts.¹⁰⁴

¹⁰¹ Jay-Anne B. Casuga, *Last-Minute Schedule Change? Some Cities Say Employers Must Pay*, BLOOMBERG BNA (Dec. 2, 2016), <https://www.bna.com/lastminute-schedule-changes-n73014447981/>; Schedules That Work Act, H.R. 3071, S. 1772 114th Congress (2015), <https://www.congress.gov/bill/114th-congress/senate-bill/1772>.

¹⁰² April Boyer & Yamilet Hurtado, *Could Predictive Scheduling Spread Across the Nation?*, DAILY BUS. REV. (Nov. 8, 2016), <http://www.dailybusinessreview.com/id=1202771737303/Could-Predictive-Scheduling-Spread-Across-the-Nation?slreturn=20170410180248>. For an in-depth analysis of the potential of expanding on-call provisions, Alexander et al. (2015) proposed “[b]roadening existing guaranteed-pay laws....[and] recasting called-in workers as on-call workers” to expand coverage. Alexander et al., *supra* note 19, at 40.

¹⁰³ San Francisco Formula Retail Employee Rights Ordinance (Police Code Articles 33F and 33G), OFFICE OF LABOR STANDARDS & ENFORCEMENT, <http://sfgov.org/olse/formula-retail-employee-rights-ordinances> (last visited 5/10/2017).

¹⁰⁴ Dori Goldstein, *Seattle’s New Scheduling Law Signals a Trend*, BLOOMBERG BNA (Sep. 22, 2016), <https://www.bna.com/seattles-new-scheduling-b57982077434/>.

Seattle’s Secure Scheduling Law, to take effect July 2017, is more comprehensive, described as “groundbreaking” by Dylan Orr, the Director of the Seattle Office of Labor Standards. The ordinance is designed to “give employees more stability in their schedules” while at the same recognizing that some employees enjoy the current flexibility and will be able to swap shifts and pick-up new ones.¹⁰⁵ The ordinance has specific anti-commodification elements in the way it embraces a fuller picture of the lived experience of employees. For example, it promotes balance between work and non-work commitments, “like caring for a family members, or working another job or attending school.”¹⁰⁶ The ordinance applies to hourly employees who work at least fifty percent of their work hours in Seattle at a large retailer or food industry employer.¹⁰⁷ In addition to requiring posting of employee schedules fourteen days in advance and requiring compensation for work schedule changes, other key features include: a good faith estimate provision, in which employers must give new-hire employees a good faith estimate of their median hours; the right to request input into the work schedule, forcing employers to “engage in an interactive process” regarding employee scheduling preferences, specifying that requests must be granted to accommodate major life events absent a bona fide business reason; and financial penalties of fines up to \$5,000 along with remedies for employees to seek unpaid wages and other costs for retaliation.¹⁰⁸ Seattle’s Mayor, Ed Murray, says the concrete steps to address income equality help “working families, young people, students, and workers of color by

¹⁰⁵ Lisa Herbold & M. Lorena González, Councilmembers, with Mayor Ed Murray, Secure Scheduling: Adding Stability & Predictability to Workers’ Schedules & Incomes, <http://www.seattle.gov/Documents/Departments/Council/Issues/SecureScheduling/Secure-Scheduling-Infographic.pdf> (last visited May 10, 2017).

¹⁰⁶ *Id.*

¹⁰⁷ *Final Administrative Rules: City of Seattle Secure Scheduling Ordinance*, OFFICE OF LABOR STANDARDS, <https://www.seattle.gov/laborstandards/ordinances/secure-scheduling> (last visited 5/10/2017).

¹⁰⁸ *Id.*

providing stability and clarity to their work schedules.”¹⁰⁹ These measures create a host of new protections for Seattle workers that could spur a national trend given the sheer number and diversity of American workers affected by contingent workforce scheduling.

At the other end of the spectrum, however, a *two steps forward, one step back* scenario is playing out. Seattle’s bold move has prompted some states—including Alabama, Arizona, Indiana, Kansas and Michigan—have laws that could preempt local predictive scheduling laws to enact laws directly seeking to preempt potential city-based predictive scheduling initiatives.¹¹⁰ Thus, not only have those states not enacted legislation to alleviate the unpredictable scheduling problem, they have intentionally set themselves against such attempts. While states often serve as laboratories for experimentation,¹¹¹ secure scheduling laws have instead found their testing facilities in progressive American cities. Due to the newness of the ordinances, the outcomes of employer judicial challenges remain to be seen.

2. *Proposed Solution Using Workforce Management*

Workforce management systems are *designed* to accommodate different variables, thus they support a proposal for training the scheduling systems to account for worker-friendly variables—such as weekly consistency, time-of-day preferences, and even employee strengths and weaknesses—in *addition* to the demand and output maximization variables. Workforce management system “algoracracies” owe their proliferation to “the malleability of code,”¹¹² so

¹⁰⁹ Goldstein, *supra* note 105.

¹¹⁰ Casuga, *supra* note 101. The American Legislative Exchange Council offers a model for these preemption laws. See *Living Wage Mandate Preemption Act*, AMERICAN LEGISLATIVE EXCHANGE COUNCIL (Jan. 28, 2013), <https://www.alec.org/model-policy/living-wage-mandate-preemption-act/> (summarized as an act that “repeals any local ‘living wage’ mandates, ordinances or laws enacted by political subdivisions of the state.”).

¹¹¹ *Gonzales v. Raich*, 545 U.S. 1 (2005) (O’Connor, J., dissenting) (citing *New State Ice Co. v. Liebmann*, 285 U.S. 262 (1932) (Brandeis, J., dissenting)).

¹¹² Aneesh, *supra* note 8, at 365.

opportunity exists at the front-end to encode employee-conscious mechanisms. Conceptually, with worker-friendly variables offsetting demand variables, the program would reify the workers back into the contingent labor scheduling scheme and help mitigate their commodification.

Given that effective employee scheduling is critical for retail profitability, with labor being the second largest cost after inventory, some algorithm modeling researchers have already discussed the need to consider employee satisfaction when creating scheduling models, especially in order to prevent turnover.¹¹³ Turnover rates are high for retail contingent workers, in particular: 124% for part-time retail workers compared to 10% for part-time workers for U.S. business generally.¹¹⁴ This negatively impacts store performance and sales. In contrast, improving employee satisfaction, retention, and productivity is a positive goal, for which it is necessary to create “fair working schedules that can also cope with employee’s personal preferences.”¹¹⁵ In other words, modeling researchers are already taking the necessary methodological steps to lay the foundation for introducing more employee-friendly variables.

An early example is a scheduling modeling study by Mohan (2008), which sought to fill in the gap that existed in the literature concerning part-time employee satisfaction.¹¹⁶ Mohan recognized that not only did part-time employees constitute a major proportion of the retail industry, but employers had shifted from using primarily full-time personnel supplemented by a few part-time workers to instead making an entire workforce part-time.¹¹⁷ Because that shift

¹¹³ Lin et. al., *supra* note 64, at 37 (2015) (addressing the problem of workforce scheduling of retail stores with employee preferences).

¹¹⁴ *Id.* at 37.

¹¹⁵ *Id.*

¹¹⁶ Srimathy Mohan, *Scheduling part-time personnel with availability restrictions and preferences to maximize employee satisfaction*, 48 MATHEMATICAL & COMPUTER MODELLING 1806, 1806-07 (2008).

¹¹⁷ *Id.*

increased part-time rotations and the number of part-time workers needed, Mohan argued employee satisfaction ought to play a more prominent role to sustain morale, even in the absence of union contract requirements. A viable and balanced algorithm should “work to minimize the overall labor costs...and try to accommodate as many of the ‘soft’ requirements regarding employee preferences as possible.”¹¹⁸ Furthermore, an employer will be more attractive to workers seeking flexible schedule if those schedules can be individually tailored.¹¹⁹ With these goals in mind, Mohan wrote an integer programming model that sought to maximize employee satisfaction while still satisfying demand requirements for each shift.¹²⁰ In addition to employee shift requirements and minimum and maximum working hours per day and per week, Mohan considered availability, seniority, and preference; employee satisfaction was defined as a function of those three components.¹²¹ At first, the model struggled to solve for all the variables, but by using “branch-and-bound enumeration procedure with additional cuts,” Mohan was able to make the scheduling model successful.¹²²

For a more recent example, Lin et al. (2015) created a workforce scheduling algorithm that took into account “fairness and employees’ personal needs” to balance employer goals of customer service with employee satisfaction.¹²³ Among the common business parameters (such as task role, and maximum and minimum work hours), Lin et al. added “personal required leave”

¹¹⁸ *Id.* at 1808.

¹¹⁹ *Id.*

¹²⁰ *Id.* at 1807.

¹²¹ *Id.* Each employee in the model guaranteed a minimum of 12 hours per week and maximum of forty, which is better than some commercialized scheduling systems that may assign both smaller and larger weekly increments. This model, with its attention to employee satisfaction, is consistent with the stability sought in predictive scheduling proposals.

¹²² Mohan. *supra* note 116, at 1808.

¹²³ Lin et al., *supra* note 64, at 38.

(giving employees options for times they did not want to work) and “partnership” (giving employees the option to work with a long-time colleague with whom they have a good working relationship, which can increase employee satisfaction and cooperation).¹²⁴ In the algorithm, “personal required leave” was set as a required constraint, while “partnership” was set as preferred but not required; and the algorithm produced a feasible scheduling solution after multiple runs.¹²⁵ Thus, ultimately Lin et al. “were able to balance [the] optimum of three goals: employee’s satisfaction, customer service level, and labor cost.”¹²⁶ These selected employee-friendly variables are simple illustrations of the kinds of preferences a high-powered workforce management model can accommodate.

Additionally, some workforce management system vendors explicitly acknowledge and strive for employee satisfaction with scheduling, presuming employers desire the same.¹²⁷ Kronos, for example, offers features to “give employees more control over their schedules for improved engagement,” such as picking up open shifts at their own impetus.¹²⁸ Kronos also advertises a concern for fairness, albeit framed in a different way than those who decry the algorithm bosses: “[a]utomatic enforcement of scheduling policies helps ensure fair, equitable treatment of all employees.”¹²⁹

As shown in the previous section, the implementation of workforce management systems has not yet borne out this advertised intent for fairness. As one Ann Taylor ATLAS worker

¹²⁴ *Id.*

¹²⁵ *Id.*

¹²⁶ *Id.* at 42.

¹²⁷ See KRONOS, *supra* note 55.

¹²⁸ See also Jenell L. S. Wittmer & James E. Martin, *Work and personal role involvement of part-time employees: Implications for attitudes and turnover intentions*, 32 J. ORG. BEHAV. 767 (2011) (providing background on part-time worker attitudes towards companies as well as company attitudes towards part-time workers).

¹²⁹ KRONOS, *supra* note 55.

described, “Computers aren’t very forgiving when it comes to an individual’s life” compared to a human manager.¹³⁰ To provide a concrete example, one worker, offered the opportunity to set scheduling preferences within the system, asked not to work Sunday mornings, Thursdays, or weekday evenings—leaving more than thirty possible work hours each week. In response, the ATLAS program generated a schedule that only gave her eight hours of work per week, and on some weeks as little as four hours per week¹³¹—which was frustratingly punitive for a computer.

Yet others insist such issues are not a problem with the programs but rather with the parameters set, and that overall algorithmic management is more fair and consistent when it comes to scheduling than the foibles of a human manager.¹³² Moreover, as a one-stop-shop for employee-employer communication, workforce management systems can bring transparency to otherwise unclear standards, like easily accessible wage rates and downloadable pay records. Kim (1997) found most employees misperceive their legal protections, believing they have more than they do,¹³³ and workforce management systems offer a way to put accurate information in employees’ hands through their mobile device or company computer. Across the pond, a senior policy researcher at the nonprofit the United Kingdom’s Citizens’ Advice Bureau commented in favor of technology that gave employees more visibility on employer practices, because

People have no idea how shambolic some jobs are at the bottom...rotas pinned on noticeboards that you have to check on your day off [and] incomplete payslips that haven’t recorded the right hours. ‘It’s good to see movement in the direction of utilising tech to help out with those challenges.’¹³⁴

¹³⁰ O’Connel, *supra* note 1.

¹³¹ *Id.*

¹³² O’Connor, *supra* note 3, at 3.

¹³³ Pauline Kim, *Bargaining with Imperfect Information: a Study of Worker Protections*, 83 CORNELL L. REV. 105 (1997).

¹³⁴ *Id.*

In terms of mobilizing technology to help, it is useful that the vendors are open to programming in new variables at the employer's request, including employee-friendly ones.

To better protect contingent workers, variables and constraint priorities can be added, and the model will make the necessary adjustments. Then, an employer can accurately evaluate whether the additional variables are able to be accommodated or if they “crash” the model such that no optimum level is found for the competing goals. A further study in modeling could test the limits of algorithmic balancing of employee and employer goals. Oftentimes, managers will claim they cannot accommodate employee preferences—such as the metric in Lin et al. (2015) for “personal required leave”—but in fact, a complex workforce management system as those already in use could accommodate such preferences. Moreover, doing so benefits not only the employee but the employer. Employee satisfaction is held to be important for robust and effective scheduling.¹³⁵ Because one of the best qualities of these systems is the ability to use forecasting to schedule for contingent demand on the front-end, likewise, employers under this proposal could handle employee preferences on the front-end rather than suffering inevitable absenteeism and turnover which detracts from customer service and the bottom line.

Like all businesses in the demand economy, the vendors will build the systems their clients want, thus the onus must be on the employer to ask for the additional variables. Although employee morale and retaining good employees are attractive goals, they are likely not strong enough in the retail sector to give impetus to this shift. Rather, due to unequal bargaining power as labor becomes further commoditized, public policy will be needed to encourage pro-employee behavior on the part of employers.

¹³⁵ See Ingels, *supra* note 61, at 1.

This can be achieved through incorporating policy goals and provisions from the predictive scheduling ordinances of San Francisco and Seattle directly into the algorithmic management of the scheduling programs. A provision requiring two-week advance notice of schedules could be automated. A good faith estimate provision could be set as a required constraint, just as Mohan's (2008) and Lin et al.'s (2015) model required a set minimum hours per week per employee, avoiding unpredictable weekly schedules ranging from fifty hours to only five. As Aneesh (2009) noted, anything can be coded—include worker protections.

IV. CONCLUSION

Approximately forty percent of American workers are doing some form of contingent labor.¹³⁶ Workforce management systems are increasingly present in the workplace, altering the dynamic of employer and employee relationships. To resist the way commodification of labor renders employees invisible through computerized scientific management that erases the human qualities of employees from the business optimization equation, the very technology being used to obscure and disenfranchise employees can be harnessed to their benefit. Because power rests with the one programming the input constraints—not on the output side where computers becomes inflexible algorithmic bosses—preemptive implementation of policy directives into the computer coding can be a key to effective just-in-time worker protections. By advocating for workers' rights at the programming level, we can reimagine the invisible worker back into the model. We can amplify the worker's voice for the contingent scheduling problem at the source, encoding ideas inspired by the new wave of predictive, secure scheduling regulation.

¹³⁶ Bersin, *supra* note 4, at 34.