Care and Coordination in Algorithmic Systems: An Economies of Worth Approach

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Algorithmic decision-making has permeated health and care domains (e.g., automated diagnoses, fall detection, caregiver staffing). Researchers have raised concerns about how these algorithms are built and how they shape fair and ethical care practices. To investigate algorithm development and understand its impact on people who provide and coordinate care, we conducted a case study of a U.S.-based senior care network and platform. We interviewed 14 technologists, 9 paid caregivers, and 7 care coordinators to explore their interactions with the platform's algorithms. We find that technologists draw on a multitude of moral frameworks to navigate complex and contradictory demands and expectations. Despite technologists' espoused commitments to fairness, accountability, and transparency, the platform reassembles problematic aspects of care labor. By analyzing how technologists justify their work, the problems that they claim to solve, the solutions they present, and caregivers' and coordinators' experiences, we advance fairness research that focuses on agency and power asymmetries in algorithmic platforms. We (1) make an empirical contribution, revealing tensions when developing and implementing algorithms and (2) provide insight into the social processes that reproduce power asymmetries in algorithmic decision-making.

CCS Concepts: • **Human-centered computing → Empirical studies in HCI**; **Field studies**.

Additional Key Words and Phrases: algorithms, care, coordination, morality, qualitative study

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1 INTRODUCTION

Previous scholarship has identified the risks associated with algorithmic systems. They entrench bias [30], reduce accountability [63], and exacerbate power asymmetries [18]. Amidst calls to address algorithmic harms and increase the fairness, transparency, and accountability of algorithmic systems, prior work has introduced social [35], technical [3, 78], and socio-technical interventions [40, 58] to address these pressing concerns. Recent social scientific approaches have treated ethics as a 'practical accomplishment' to understand how efforts toward 'being ethical' organize the daily practices of technology professionals [71, 80]. Building on this emergent stream of research, we investigate the processes by which technologists balance ethical principles with contradictory demands and expectations as they build algorithms. To explore this issue and understand its consequences for other actors, we conducted a case study of a platform for non-medical home care for older adults. We focused on situated acts of description, justification, and criticism to explore the moral frameworks and concepts that different actors use to make decisions in the presence of uncertainty.

Characterized by an overlap between difficult working conditions and emotional attachment [4], care work stands out as a paradigmatic case for understanding technologists' moral narratives. Over the past half-century, the most appropriate way of caring for older adults has been a topic of concern and ongoing debate amongst policymakers, academics, and interest groups in the U.S. and globally. In the U.S., social gerontologists have critiqued private, for-profit aging services [28]. Care work is also heavily gendered and racialized, both in terms of the discourse used to describe it and the people who provide it [1, 33, 54]. While many of the programs and policies subject to criticism remain in place, a great deal has changed since the late twentieth century. New technologies and organizational forms have emerged for the care of older adults.

In this paper, we focus on non-medical home care because of the contradictory demands of staffing shifts reliably and efficiently while meeting the needs and expectations of care workers, older adult care recipients, and care coordinators. Such care does not involve skilled nursing services, yet it provides support for older adults' physical and lifestyle needs as they continue to age in their homes. While care is colloquially associated with positive affect [62], care workers face a variety of labor market challenges, including low wages [26], discrimination, and political disenfranchisement [32]. Amidst these and other calls to "unsettle" care [19, 38, 56], prior work [70] demonstrates how technology companies have used care to manufacture and legitimize unfair, opaque datafication practices. With these tensions in mind, we follow calls to determine how care is enacted in practice [65].

In particular, platforms for paid, non-medical home care for older adults have emerged to meet a growing demand for home care [22]. These platforms surveil care workers in attempts to formalize aspects of care work and meet customer expectations, often in ways that portend algorithmic discrimination [76]. Given the complex relationship between the social practices that materialize these platforms and the moral terrain of care work, constructing algorithms for care work is an important case for understanding how technologists negotiate contradictory demands and expectations.

We investigate the metrics, algorithms, and organizational practices that technologists use to manage care workers. Taking these operations as inherently moral and political, we sought to untangle the situated moral frameworks and concepts that participants use to describe their work [2, 13]. We also sought to understand how technologists' decisions impact other actors on the platform. To accomplish this, we interviewed technologists, caregivers, and care coordinators. We find that technologists draw on multiple moral frameworks, exploiting various meanings of 'care' to resolve contradictions. This paper makes an empirical contribution, as we unpack

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how algorithms and the data infrastructures they encompass shape care practices and highlight mismatches between technologists' drive towards efficiency and the situated practices of caregivers and coordinators. We also make a theoretical contribution, introducing Boltanski and Thévenot's economies of worth (EoW) framework [13] for analyzing emergent algorithmic practices. In doing so, we highlight the significance of studying morality as technologists build and implement algorithms in domains outside the specific context of ethics. At stake is how we understand power and agency in an algorithmic society [15]. By focusing attention on the situated and flexible nature of human agency, we contribute to ongoing discussions within the algorithmic fairness community about how to study how power is distributed in algorithmic systems [47]. Rather than treating technological infrastructures as stabilized artifacts, the approach that we advocate in favor of uncovers the normative contradictions that underlie technology development by investigating how individual actors engage with various moral perspectives.

2 PRIOR WORK

Previous scholarship on the ethical and moral dimensions of technologists' practices has primarily focused on organizational and cultural factors where actors—individuals and organizations—self-describe as "ethical." For example, Ziewitz [80] conducted an ethnographic investigation of the British search engine optimization (SEO) industry. Drawing on fieldwork at a self-described ethical marketing company, he shows that participants engage in a variety of practices to navigate boundaries between 'good' and 'bad' optimization. He argues that this *"ethical work"* demonstrates that optimization has become a site of governance and contestation as workers navigate moral ambiguity. Madaio et al. [55] conducted semi-structured interviews with AI practitioners to understand how they identify disparate outcomes between demographic groups. They identified that technologists faced challenges in choosing performance metrics, identifying relevant stakeholders and impacted demographic groups, and collecting datasets, arguing that these issues negatively impact fairness work. Additional research has investigated and critiqued "ethics owners" or "Silicon Valley professionals tasked with managing the ethical footprints of tech companies" [57], and examined how actors ascribe meaning to and stabilize "ethics" in AI design [71].

While these studies provide insight into the moral practices and discourse of technology professionals, we know less about how technologists and other actors moralize their work outside the specific context of 'ethics.' Further, processes of moralization have yet to be theorized by the FAccT community. To discuss this gap, we call attention to studies investigating how technology workers make decisions, especially when they are not explicitly asked to be ethical. Work in this area includes empirical studies of data annotators that document disparities in how these actors make decisions about image classification, the result of frictions between culturally informed values, organizational structure, and power asymmetries [59, 60, 68, 77]. These studies document situational variation and the factors that influence it as workers exercise discretion and make decisions that ultimately shape algorithms. Further, while studies of platform companies have investigated the cultural aspects of algorithmic systems from both the perspectives of technologists [16, 39, 44, 69] and other workers [27, 48, 76], questions remain regarding the relationship between the moral perspectives of these actors.

These questions are especially relevant as we consider the development of metrics and algorithms for the assessment and allocation of care work. While care is understood in a variety of ways [9, 14, 42], our investigation seeks to understand the relationship between algorithms and *"the varied activities of providing for the needs and well-being of another person""* [32]. Such work is heavily racialized and gendered, often invisible, usually accorded little value, and only sometimes recognized as skilled [25]. These factors contribute to a litany of challenges for caregivers including: low wages [26], discrimination [24], and political disenfranchisement [34]. As Ticona and Mateescu [76] argue, this distinct history of care work influences the development of care work platforms in ways that exacerbate existing inequalities and create new challenges.

2.1 Theoretical Framework

To understand how humans impact the model development and algorithmic decision-making process, we turn toward the field of economic sociology, specifically drawing on "morals and markets" scholarship [31, 50, 66, 72, 79]. This literature blurs the boundaries between "economic" and "social" domains to focus on how cultural, moral, and financial worth is ascribed to people, activities, qualities, and objects [5, 8, 13, 51]. Such an approach highlights the local and contextual decision-making across actors as they face uncertainty [72, 73], similar to the coordination that takes place between technologists, caregivers, and coordinators for home care in our study. We borrow insights from Boltanski and Thévenot [13] to illuminate how these actors justify their decisions and actions as they interact with care staffing algorithms.

Boltanski and Thévenot [13] focus on how compromise is achieved in situations characterized by opposing viewpoints. To resolve disputes, actors invoke mutually agreeable justifications to establish and compare the worth of things, actions, people, and beliefs. These justification practices are not based on universal principles or objective criteria; instead, they depend on the social and cultural contexts in which they are located. These moral frameworks, or "economies of worth" (EoW), encompass a system of concepts and intricate criteria for evaluation. In developing their framework, Boltanski and Thévenot systematically analyzed people's reasons for harboring an opinion or adopting a course of action. In *On Justification*, they develop a tentative categorization of the most common EoW present in contemporary French society. Articulating six broad, ideal-type forms of justification, they associate each with a particular moral philosopher. Table 1 provides an overview of these moral frameworks[1]. Notably, the authors acknowledge that the distinction between each EoW is neither clear-cut nor restricted to separate domains (i.e., the domestic EoW is not limited to the home and family). Additionally, new forms of justification may emerge, and existing frameworks may change over time[2].

[1]For an accessible introduction to the significant concepts in article form, see [12].
[2]For example, later scholarship has introduced the project-oriented EoW [11], and the 'green' (sustainable) EoW [75].

Table 1. Six economies of worth, their organizing principles, and associated moral philosophers, as articulated by Boltanski and Thévenot [13]

0.48p0.075 p0.4 p0.3

EoW	Principles	Philosopher
Market	Gain, self-interest, profit and loss	Adam Smith
Industrial	Efficiency, productivity, technical competence	Saint Simon
Domestic	Tradition and responsibility	Jacques-Bénigne Bossuet
Civic	Solidarity, representation, freedom	Jean-Jacques Rousseau
Inspiration	Creativity, innovation	Saint Augustine
Fame	Recognition, popularity	Thomas Hobbes

To illustrate the mechanics of this framework, we draw on an example inspired by Altomonte's work on patient discharge decisions at a post-acute care unit for older adults [6]. Post-acute care refers to the medical and rehabilitation services provided to patients after a hospital stay of at least three days. While post-acute care is oriented toward patient safety and preventing hospital readmission, these motivations intersect with cost-limiting reimbursement policies and particular ideas about independence in old age [52]. Staff may appeal to multiple EoW as they make decisions about patient discharge. For example, they might simultaneously consider the facility's reimbursement rates (market), institutional responsibility to provide for an aging population (civic), and familial obligation to care for an older loved one (domestic). As they balance the priorities associated with each EoW, they might appeal to moral concepts (i.e., independence) to make a decision in the context of uncertainty[3].

Whether actors have a hand in the design of algorithms or are subject to their logic, the EoW framework foregrounds how actors present, question, criticize, or justify the principles underlying their interactions with algorithms. Treating the development of technology as a moral action, we mobilize Boltanski and Thévenot's work to focus on the patterns of action, symbolic investment, and critical capacities that participants draw on in discussing their interaction with care staffing algorithms. As we develop our analysis, we use these EoW to demonstrate the utility of attending to the use of different moral frameworks. We argue that this approach provides insight into how technologists reconcile competing demands and assign meaning to the algorithms they build. By incorporating the perspectives of caregivers and care coordinators, we reveal how these negotiations create asymmetries of power, exacerbate existing inequalities, and contribute to new challenges for caregivers despite technologists' best intentions. We contend that a shared orientation toward the common goal of 'care' maintains caregivers' and coordinators' commitment to the platform despite unmet expectations. In doing so, we highlight how people exploit multiple meanings of moral concepts [6] and the fact that hierarchies of interpretations emerge [74]. Researchers and practitioners can use these insights to identify how demands for fairness, transparency, and accountability interact with context-specific challenges that technologists face in their work. In turn, our findings can be used in future research to identify opportunities for interventions oriented toward improving the design of algorithmic systems.

[3]In Altomonte's case, beliefs that long-term care institutions "crushed elderly people's autonomy" [6] resolved moral tensions surrounding discharge decisions. However, 'independence' took on different meanings across situations, highlighting how drawing on different EoW establishes boundaries around what is worthy and appropriate in a given context.

3 METHODS

3.1 Case Description

The subject of our case study, CareTech[4], is one of several start-ups that are credited with *"reinventing the [home care] agency model"* [22]. Prior to data collection, CareTech acquired StayHome, a traditional home care agency franchise. To contextualize our findings, we briefly discuss CareTech's business model.

CareTech partners with traditional home care agencies to support back-end administrative, legal, compliance, and logistics functions in exchange for a share of partner agencies' revenue, employing caregivers directly. Caregivers assist with activities of daily living (i.e., bathing, dressing, getting in or out of a bed or chair, walking, using the toilet, eating) [43], and instrumental activities of daily living (i.e., cooking, cleaning, transportation, laundry, managing finances) [46]. CareTech's use of algorithms to match caregivers to care recipients is central to our case. When we started data collection, CareTech's technology platform had recently been implemented at StayHome's company-owned agencies, providing a unique opportunity to investigate care algorithm implementation.

In this paper, we focus primarily on CareTech's staffing practices. CareTech uses metrics and algorithms, along with human management, to staff shifts. Staffing algorithms have a role at two main sites: as initial schedules were made and when other caregivers called off their shifts. When caregivers are scheduled during their onboarding, staff members at CareTech use algorithmic recommendation systems to match caregivers with care recipients. Evaluation metrics (i.e., timeliness, consistency, application usage, and call-offs), along with other data (e.g., caregiver commute time, number of complaints) are used to match caregivers and care recipients. Coordinators receive weekly surveys about the quality of care provided, and provide responses on a linear scale[5].

3.2 Recruitment and Roles

After IRB approval, we recruited participants—technologists (n = 14), caregivers (n = 9), and coordinators (n = 7)—through a partnership with CareTech and StayHome for interviews using convenience and purposive sampling [10]. StayHome's research staff arranged a site visit and helped recruit participants. We provided a brief description of the study and a screening questionnaire distributed amongst the caregivers and coordinators over email. This approach provided an opportunity to learn from technologists, caregivers, coordinators who were enthusiastic about sharing their experiences with the platform. Table 2 and table 3 provide an overview of participant profiles.

(1) **Technologists:** Technologists consisted of software engineers, designers, product managers, and data and operations

[4]We have changed the names of the companies and individuals included in this study to preserve anonymity.

[5]Measures were not disclosed by CareTech employees, caregivers were not informed about evaluation criteria, and coordinators were not able to recall specific survey questions.

workers. Software engineers talked about building CareTech's features and the company's history. Designers develop CareTech's front-end user experience for caregivers. Designers, the operations team, and a product manager described how they approached curating the caregiver experience. The data scientists, data analysts, and data stewards discussed the metrics used to measure caregiver performance, the data that staffing algorithms use, and how algorithms work in practice.

(2) **Caregivers:** We use the term 'caregivers' to refer to the people employed by CareTech to provide care for pay.
(3) **Coordinators:** The term 'coordinators' refers to people that pay for CareTech's services and coordinate their delivery, usually on behalf of an older loved one.

3.3 Limitations

Recruiting interview participants through a partnership with StayHome and CareTech potentially biased results toward more positive perspectives of organizational practices. Caregivers and coordinators with more negative views about the company may have been reluctant to share their opinions or participate in interviews altogether due to fears of retaliation from the platform. Convenience sampling limited the extent to which we were able to understand differences across demographic subgroups. Future work should explore this issue. Further, recruitment overlooked the perspectives of care coordinators and caregivers who have left the platform due to difficulties.

3.4 Interviews and Observations

This study draws on data gathered from one week of observation performed in July 2022 and 30 interviews conducted between May 2022 and August 2022. We conducted in-depth interviews to understand the cultural inputs that shape algorithm design and the implications for caregivers and coordinators. Interviews are well-suited for understanding social dimensions of how people interpret the world and take actions based on those interpretations [64]. Interviews with technology workers show how they make sense of their work and build systems [67], and interviews with caregivers and coordinators show that care practices diverge from organizational philosophy [53]. After several interviews, one researcher visited StayHome's global headquarters and a company-owned agency, located in a major Midwestern city in the U.S. The researcher toured the company's offices and met with support staff. In addition, the researcher engaged these actors in informal conversations to learn how StayHome and CareTech operate. To understand how the platform is presented to caregivers and what aspects of paid care work are emphasized, the researcher observed a caregiver training session on lifting and transferring techniques at one of StayHome's company-owned franchises and attended a virtual onboarding session with CareTech in the afternoon.

We developed the interview guide with interest in valuation and evaluation practices as they occur on CareTech's platform. Treating valuation as a moral outlook, we drew on practice-oriented approaches to understanding how different actors conceptualize and contribute value in labor contexts [36]. Examining the practices of the people that develop platforms and those who are subject to their architecture provides an opportunity to identify the underlying justifications and actions that shape and transform care work as it occurs on the ground. Interview questions thus sought to elicit interviewees' daily practices, what elements of their work they described as most important, the least favorite aspects of their work, and their ideological orientation towards the concept of 'care.'

After obtaining consent, we recorded the interviews, which lasted between 45 and 90 minutes and took place mainly over Zoom. However, we did interview several caregivers and one coordinator in person.

Table 2. Caregivers and care coordinators' names (pseudonyms) and relation to the platform.

Name	Role
Sharon	Caregiver
July	Caregiver
Ansel	Caregiver
Chauncey	Caregiver
Pepper	Caregiver
Hayden	Caregiver
Lily	Caregiver
Hazel	Caregiver
Francine	Caregiver
Sonia	Coordinator
Phyllis	Coordinator
Brooks	Coordinator
Riley	Coordinator
Winnie	Coordinator
Helen	Coordinator
Opal	Coordinator

Table 3. Technologists' names (pseudonyms) and positions at CareTech. We have slightly changed some respondents' job titles to preserve confidentiality.

Participant name	Job title
Megan	IT support
Kennedy	Product manager
Jackson	Operations software manager
Geraldine	Data steward
Floyd	Engineering manager
Bodhi	Designer
Richard	Director of engineering
Aria	Data scientist
Kate	Designer
Robert	Data scientist
Aiden	Software engineer
Sandra	Relationship manager
Madelyn	Operations manager
Wendy	Data analyst

3.5 Data Analysis

To analyze data from interviews, we utilized a three-part process [45]. After each interview and day of observation, one researcher wrote analytic memos—informal notes used to capture salient aspects of observations and interviews, reflect on data themes, and identify meaningful concepts and practices. As we accumulated data from interviews, observations, and prior work, we inductively identified themes that cut across interviews (e.g., 'worker motivation,' 'creating value,' 'bias and discrimination'). The research team members iteratively refined these themes through discussion and mapped them to the EoW framework. We used a third-party qualitative coding tool (NVivo) to complete the coding process. To make theoretical sense of the data, we returned to the literature and iterated between data and extant research.

4 FINDINGS

Our findings indicate that technologists drew on several economies of worth—which we refer to as moral frameworks—to navigate the seemingly irreconcilable demands of home care. They referenced multiple interpretations of the term 'care' to resolve contradictions. We illustrate this point by first focusing on how technologists described the problems that they claim to solve. Then, we analyze the nature of the solutions they presented, highlighting how technologists imbued different aspects of algorithm design and function with moral meanings. This finding demonstrates the interpretive flexibility of technological artifacts. Finally, we turn to the perspectives of caregivers and coordinators. Their accounts show how algorithmic staffing practices created new forms of uncertainty—the mirror of technologists' stated intentions.

4.1 Navigating Contextual Complexity

Technologists drew on multiple moral frameworks to navigate expectations and demands, appealing to various interpretations of 'care' to reconcile the contradictory pressures they face. The technologists we interviewed framed CareTech as a platform developed to address traditional home care agencies' logistical and operational challenges. In this context, they appealed to an industrial moral framework, framing their work as introducing greater levels of efficiency and rationalization to the home care industry. However, many of the technologists we interviewed also framed their work in terms of a civic moral framework, critiquing prior staffing practices as subjective, opaque, unfair, and harmful to the material well-being of caregivers. Although these two narratives may appear contradictory, technologists unified these demands by appealing to the societal need for more care. For example, improvements in efficiency were discussed in terms of increasing the affordability of care while improving working conditions was imagined as growing the size of the caregiving workforce. We argue that technologists navigate complexity when creating and developing care algorithms by strategically appealing to justifications corresponding to different moral frameworks, drawing on multiple interpretations of a single term to move between them. Throughout this section, we draw attention to how technologists position algorithmic staffing practices as one solution to the problems they described.

4.1.1 Platform Description & Motivations. The rhetoric that technologists and company executives used to describe their motivation for building the platform appealed to domestic and social goods. In press releases and on the company website, CareTech's executives described their frustrations in searching for care for their own parents. Similarly, technologists invoked ideas of familial responsibility, relaying stories about their difficulties in finding care for aging parents. Technologists also drew on more civic-oriented notions of good, framing their work with reference to positive social change. For example, Richard described, *"being part of something that can have a positive impact on society."* The company's mission statement, was described as 'improving care in society'[6], highlighting the significance of a single moral concept in technologists' discourse.

In discussing the company's strategy, the technologists we interviewed described CareTech as a "platform," "communication company," or "logistical engine,", foregrounding CareTech's use of digital technology to improve efficiency, and framed their work as a response to logistical challenges in the home care industry. Aiden described what he framed as the company's main value proposition:

> I think the big sort of sell is, it is getting harder and harder to operate care. I think it is getting more expensive...the core value proposition is where we are trying to figure out how to build a platform around doing this, and helping agencies focus more on their relationships with their communities and customers.

He elaborated that, by centralizing operations, CareTech offers partner agencies relief from work that is *"consuming and grueling, whether it's paperwork, management, documentation, staffing, logistics, or being on call all the time."* By filling this role, CareTech *"frees up agencies to both source customers and maintain that relationship and kind of connection."* (Aiden) Repeated references to the relationship between CareTech and the agencies with which it partners serve two purposes. First, they identify areas where CareTech uses technology to increase efficiency in the home care industry. This problem formulation provides the background for how organizational solutions are framed. Second, they format a division of labor. In this account, partner agencies are positioned as responsible for managing relationships in local markets, while the platform oversees aspects of labor control and management. Here, technologists frame the platform's work in industrial terms and partner agencies in domestic terms.

4.1.2 Staffing Practices as Solutions. As they justified their work, technologists also blended elements from multiple moral frameworks. Specifically, they simultaneously appealed to notions of market dominance and civic responsibility. This overlap materialized as Robert, a data scientist, stated that the company's scale offered a *"unified view across markets"* and provided access to a sufficient amount of data to use statistical techniques to *"learn from the data to provide better home care"*, serving as a *"competitive differentiator in the market."* In addition, Floyd framed the company's size as affording more 'careful' staffing practice:

> From a systemic perspective, when you are bigger you have these systems in place, and you do not have to

[6]We paraphrased the company's mission statement to preserve anonymity.

> guilt somebody into working a shift. If you need a shift filled, you have a stable of hundreds of caregivers you can reach out to, it is just a matter of how much bonus you have to put on it.

These rhetorical strategies demonstrate how technologists draw on multiple moral frameworks to present their work as solutions to different problems.

Building on discussions of CareTech's organizational strategy, technologists most concretely articulated their efforts toward 'improving care in society' through labor management. They started these discussions by problematizing caregiver job quality under legacy home care practices as associated with low wages, few benefits, rigid scheduling practices, and little recognition of caregivers' efforts. Kennedy critiqued legacy staffing practices on the grounds of fairness and transparency:

> There's a lot of favoritism that happens. There's a lack of transparency. And so as you can imagine, the caregivers who work the most shifts, they're able to earn the most amount of money. And that's really helping to improve their lives and livelihoods.

Other technologists framed algorithmic staffing as a solution to the legacy staffing practices that Kennedy identified as opaque and unfair. While Kennedy incorporated concerns about material well-being into her critiques, other technologists generally avoided discussing their efforts toward increasing caregiver job quality in terms of a market-based moral framework. This may have resulted from the market constraints of care, where the price for private pay home care is inaccessible for many families. Aria explained that raising wages for caregivers would make the price of care *"unpayable"* by many clients.

4.1.3 Professionalizing Care. Instead, technologists framed their efforts as attempts to improve caregivers' status and provide them with a career. Aria noted that improving the collective status of caregivers was part of CareTech's mission since its founding, emphasizing challenging aspects of the job:

> I think that a really big piece of what CareTech is trying to do and has been trying to do since the beginning is you know, elevate the profession of caregiving. And truly treat it a profession instead of just a job...because it's a difficult, emotionally intense, sometimes physically intense thing to do.

Floyd described further aspirations to elevate caregivers' status through professionalization:

> I would say that [career] is a north star for us. I think everyone views that as an innovation that we can and should make, and the profession is worth it... we're working towards it, but we haven't actually gotten there yet.

These discussions highlight the links that technologists establish between different moral frameworks as they respond to a complex set of challenges. While they expressed concern about the value that care holds in society, increasing the pecuniary value of care was viewed as infeasible. Technologists responded to this problem by appealing to the status of the profession. However, technologists' most defined solutions came in the form of staffing algorithms.

4.2 Datafying Care

We unpack staffing practices at CareTech, which we argue are emblematic of technological solutionism. Our analysis reveals that technologists associated different aspects of staffing algorithms with different moral frameworks. We argue that how decisions are made about who is best suited for particular shifts—and why—is changing with the advent and implementation of algorithmic staffing tools as technologists prioritize efficiency. However, discussions with technologists show that there are tensions present in the use of algorithms. On the one hand, technologists discussed their work in terms of trying to increase caregiver performance. Performance evaluation metrics break care into a set of constituent elements closely aligned with operational efficiency (an appeal to the industrial moral framework). On the other hand, technologists described their work as oriented toward establishing long-term relationships between caregivers and care recipients (an appeal to the domestic moral framework).

The metrics and measurements that support algorithmic staffing practices are most closely associated with notions of productivity and operational efficiency. Technologists presented one part of their work as oriented toward increasing the *"performance, or perceived performance of the caregiver."* (Floyd) They described how this work is accomplished by measuring: (1) timeliness (how frequently a caregiver arrives to a shift on time); (2) consistency (adherence to scheduled shifts); (3) application usage (whether or not the caregiver uses the application to clock in to and out of shifts and evaluate care recipient well-being); and (4) call-offs (shifts not released seven days in advance). While this evaluation practice makes care legible based on a discrete set of metrics, the composition of these metrics is oriented toward operational efficiency rather than the experiences of care recipients or care coordinators.

Technologists contrasted their work with platforms in the ride-hailing industry[7], describing how their work was motivated by the desire to establish long-term relationships between caregivers and care recipients. They referenced algorithms in terms that framed care as a holistic practice, often comparing the product of their work to other intimate relationships. Staffing algorithms have a role at two main sites: as initial schedules were made and when other caregivers called off their shifts. When caregivers are scheduled during their onboarding, staff members at CareTech use algorithmic recommendation systems to match caregivers with care recipients. In both cases, platform architects compared the matching process to other intimate relations between caregivers and care recipients. In Sandra's words:

> Once the data are all collected, [the algorithm] gives us a list of caregivers, and it was ranked by most likely to be picked up by the caregiver...there is a...I don't want to say negotiating, but there are conversations that go

[7] A ride-hailing company is a type of transportation service that allows individuals to use a smartphone app to request and receive rides from private drivers. The drivers are typically independent contractors who use their personal vehicles to provide transportation services. Examples of ride-hailing companies include Uber and Lyft.

> back and forth. Because it does become an arranged marriage when you're putting it inside the home.

In instances where shifts opened up with clients, the platform gives caregivers the option to pick up shifts with these clients through a user interface that Floyd described as *"not not tinder[8] inspired."* In advancing these relationship-based arguments, technologists define quality care by referencing domestic relationships between caregivers and care recipients.

On the one hand, technologists seek to build a platform that efficiently delivers consistent care to a growing number of older adult care recipients. On the other, they describe their work as motivated by a desire to optimize relationships between caregivers and care recipients. At the same time, they framed their efforts as improving fairness, accountability, and transparency in staffing practices. Pairing discussions of metrics—which break care down into constituent elements associated with industrial efficiency—with algorithmic staffing practices—which technologists use to frame evaluation in domestic terms—reveals that these actors associate different parts of their job with distinct moral frameworks to meet a complex set of demands. Further, interviews with caregivers and coordinators reveal that these performance evaluation criteria and platform staffing practices are a source of tension and stress.

4.3 Platform Asymmetries

What are the consequences of technologists' actions? To answer this question, we turn to platform caregivers' and care coordinators' perspectives and experiences. Contrary to technologists' aspirations to use algorithms to build a fairer, more transparent order, algorithmic staffing practices in fact created new conditions of uncertainty for caregivers and coordinators. First, we focus on evaluation practices. CareTech's app for caregivers displays ratings across several metrics related to operational aspects of care delivery (i.e., timeliness, consistency, application usage, and call-offs). The platform also sends weekly caregiver evaluation surveys to coordinators but does not share this feedback directly with caregivers. Further, caregivers rarely received qualitative feedback regarding the quality of care they provided. Caregivers discussed how these aspects of platform design contributed to ambiguity regarding insight into their performance, while coordinators approached completing survey-based caregiver evaluations with ambivalence. Second, we analyze caregivers' interactions with CareTech's staffing practices. Caregivers described experiencing collapsed boundaries between working and personal time. Despite these new challenges, the caregivers and coordinators we interviewed did not mention a desire to leave the platform, suggesting that their commitment to care facilitated commitment to the platform.

4.3.1 Ambiguity and Ambivalence. While caregivers described providing care as meaningful and were generally content with the conditions they faced on the platform, they discussed a lack of clarity regarding expectations and performance. As Hayden said,

> I believe that the clients, they also rate us after every shift. So then if we get rated lowly every time or pretty consistently, I'm sure they will reach out to us...I don't know that it helps us rate our care and how well we're doing with our clients, but I don't know how else they could do that...you hear stories of people who are dissatisfied with their care, and that's hard to tell.

It was only after connecting with other caregivers that Hayden learned that it was possible to request a performance evaluation from CareTech.

Further, the opacity of metrics created feelings of worry for caregivers about their performance. As a new caregiver on the platform, Hazel worried about a low client consistency rating and discussed needing to take the initiative to understand why she received low ratings across other metrics. Puzzled about low application usage ratings, Hazel described needing to reach out to CareTech to understand *"what [she] was missing."* CareTech's communication and evaluation practices created unclear situations with multiple interpretations and required additional labor on the part of caregivers to understand how care recipients experienced their care and how the platform judged their performance.

Coordinators, on the other hand, discussed their own evaluation practices as infused with ambivalence—a finding that we found surprising given the intimate and impactful context of care for an older loved one. While coordinators described clear feelings about the care provided to loved ones, our interviewees responded to CareTech's evaluation surveys inconsistently. Coordinators expressed satisfaction with the care that caregivers provided and thus did not feel a need to fill out the company's weekly caregiver evaluation survey, described how these surveys were not as useful compared to in-person evaluations performed over more extended periods, or expressed that they did not feel their feedback through these outlets was listened to by CareTech. Phyllis—who lives with her care recipient—described that since the quality of care was so consistent, there was not a need to be very detailed in her evaluations: *"they will send out those [surveys] weekly...so you click on attentiveness, preparation, and I don't remember what they all are. There's about five of them. I don't get very detailed."* On the other hand, Brooks—who did not live with his care recipient, and was dissatisfied with the consistency of staffing provided by CareTech—described feeling overwhelmed by the amount of evaluating he was asked to do:

> For each one of the caregivers that has been in, they're asking for an opinion for eight to 10 caregivers every Monday, on the same thing, the same people doing the same thing. I've had a hard time seeing the value on a weekly basis.

He saw more value in evaluations carried out over longer intervals as it had been before the acquisition:

> There used to be the quarterly report where they would actually go in and visit and come back and say, 'this has changed, or this looks like it's changed'...when someone steps in four or five times a year those are the ones that can pick out some things.

Opal, who uses CareTech to provide care to her husband, discussed her attitude towards the surveys: *"Honestly, I ignore [the surveys]. It's not something I want to do. I don't know why. I know they're doing great."* These perspectives demonstrate a difference in the worth

[8]Tinder is an online dating platform; users "swipe right" to like or "swipe left" to dislike other users' profiles.

actors ascribed to particular evaluation practices, highlighting a mismatch between technologists', coordinators', and caregivers' perspectives.

Other coordinators described non-use of CareTech's evaluation infrastructure, even when there were striking departures from care expectations. Coordinators justified their approach by appealing to different moral frameworks. Riley said, *"what did happen one time, and I should probably be more tuned into it...there was one day when one of the caregivers didn't show up at all. And I didn't know about it until the next day."* She justified the non-use through appeals to a domestic moral framework: *"I'm not as hands-on, I'm not looking at the app to see what they're doing. I get my feedback on how they're doing from my mom and dad."* Winnie, who relied on a caregiver to transport her mother to church on Sunday mornings, described situations where sometimes a caregiver assigned to the shift couldn't drive or had no car. Even so, she did not fill out regular surveys, drawing on her experience as a business owner (industrial) to express that she understood the challenges of staffing shifts: *"it's a very hard thing to maneuver in the world that we're walking in. We own a small business. We employ 13 ladies, so I understand."* At the same time, she seemed to negatively moralize non-use: *"I will be honest with you that a survey has come...I haven't filled it out. So I haven't done due diligence on my part. You know, so I'm going to own that part."* While some coordinators expressed frustration about consistency, communication, quality, and the efficacy of evaluation practices, they appealed to multiple moral frameworks to justify different uses of evaluation infrastructure.

4.3.2 Work Practices and Professional Boundaries. Continued discussion with caregivers provided insight into how the problems that technologists faced contributed to aspects of platform design. The need to fill open shifts and coordinate care work across multiple individuals—associated with an industrial moral framework—took precedence over other concerns. Francine's account of interactions with CareTech provides an example of how the need to staff shifts devalued communication about performance: *"they have never given me any feedback or evaluation, the only time they call is about the schedule, asking if you can work more."* We argue that technologists' prioritization of needs associated with the industrial moral framework eroded the boundary between caregivers' work and personal lives and changed care practices.

For example, the platform uses a notification system to bring open shifts to caregivers' attention. However, Pepper described how the constant notification stream makes it difficult for her to differentiate between work and leisure time:

> I can tell they have a lot of shifts to fill in. Am I going to be under pressure? They've asked me for five things, and you said no to all of them, it feels like I should say yes to something now. It's just a little harder to be either working or not working...when you see your phone in the morning and you see all those notifications there.

Hayden described receiving *"30 to 40"* notifications a day from the app, even after reaching out to CareTech to express that they could not work any more shifts. Further, they described confusion and frustration regarding the processes by which shifts were initially assigned:

> I actually said no to [the shift], but they scheduled me anyway. Which was how I got a lot of my shifts, which was okay...I know sometimes it sounds weird, but I would say no to a shift, maybe they'd think that I said yes.

This account suggests that the platform does not allow for as much flexibility as technologists imagine.

In contrast to legacy record-keeping procedures, where caregivers left paper-based care notes in clients' homes, CareTech's platform requires that caregivers describe their shifts upon clocking out in an electronic journal that is viewable by coordinators and other caregivers. While caregivers described that the journal helped them feel more prepared for each shift, they also described reading journal entries outside of working hours, which provided further evidence for blurred boundaries between work and personal life. For example, Chauncey described reading entries *"at night, before I go to bed, I start reading if I'm going to work the next morning."* In addition, platform architecture requiring caregivers to complete these logs changed caregivers' relationship to time spent on the job. Francine described how filling out the notes, especially in the time-sensitive context of a shift, placed pressure on how she spent time providing care: *"if you clock out right at a minute after [your shift ends] they get you on that."* Efforts to avoid disciplinary action created new relationships to time: *"I just always try to clock out a few minutes before because you get all these questions before closing out the app."* (Francine) In these cases, platform architecture changed caregivers' relationships with their time both on and off the clock, which put caregivers under additional pressure.

We found that aspects of platform and algorithm design create new forms of uncertainty for caregivers and coordinators. We argue that this results from a mismatch between technologists' moral reasoning and that of other platform actors. In addition, the need to fill open shifts and coordinate work across many individuals prioritizes a logic of efficiency over concerns for caregiver job quality. Despite coordinators' unmet expectations and new pressures that the platform placed on caregivers, both sets of actors maintain a commitment to the platform. A possible explanation for continued attachment is the moral significance of 'care.' While the term carries various meanings across actors and situations, it may act as a resource that maintains a particular status quo by mitigating organized critique of or departure from the platform.

5 DISCUSSION

Building on scholarship that treats ethics in technology organizations as an ongoing practice [80], our research focuses on the moral dimensions of technologists' practices in the senior care industry. Recent work argues that the meaning of 'ethics' in AI emerges and stabilizes through principles, needs, narratives, materializations, and cultural genealogies [71]. Less is known about how technologists moralize interactions with algorithms in everyday practice. This process is important because moral reasoning establishes boundaries around how long-standing problems are defined and suitable solutions are presented [13, 37]. To explore this phenomenon, we conducted a case study of a non-medical home care platform for older adults, focusing our investigation on actors' interactions with

the company's staffing algorithms. The case of paid care provides unique insight into how actors coordinate their actions as they face a complex set of demands and expectations. By paying particular attention to how actors present, question, criticize, and justify the principles underlying their interactions with algorithms, we find that actors treat moral frameworks as resources to navigate complexity. Contradictions between these moral frameworks are resolved by appealing to multiple interpretations of the concept of care.

By advancing the notion that judgments about the moral worth of people, objects, behaviors, and beliefs are influenced by the values and norms of a particular community or context, the Economies of Worth (EoW) framework [13] highlights *moral polysemy* [6]. This term refers to multiple interpretations and meanings of moral concepts, which can result in differing views and perceptions of what is considered fair and ethical in algorithmic systems. By recognizing that multiple moral frameworks exist and actors' capacity to make compromises between them, Boltanski and Thévenot's framework challenges the idea of a universal, objective morality—even within a particular community. We show that actors drew on differing views and perceptions of 'care' as they discussed their work, highlighting the situational variation of moral terms and concepts.

Moral polysemy can pose a challenge for the FAccT community in terms of defining what counts as ethical AI, as there may be conflicting values and perspectives not just among different actors but across different contexts. Moral polysemy can result in misunderstandings and miscommunications between actors, leading to further challenges as technologists, regulators, impacted users, and other groups seek to achieve fair, accountable, and transparent algorithmic systems. Unintended consequences abound, even when algorithms are designed with principles of better care in mind. Actors in less powerful positions find themselves in new, uncertain, and sometimes exploitative conditions as they are subject to technologists' moral projects.

We briefly return to three of our main empirical findings to unpack their salience for the FAccT community. First, technologists referred to multiple moral frameworks to make sense of their work and coordinate action as they face seemingly irreconcilable demands. Home care organizations—whether they use legacy or algorithmic staffing practices—are caught among contradictory demands. They must reliably staff shifts to ensure care recipient safety and well-being, maintain acceptable working conditions for caregivers to avoid high turnover, and comply with the fiscal realities that characterize the market for paid care. To resolve contradictions, the technologists in our study mobilized various rhetorical strategies (e.g., critique, justification, juxtaposition) and exploited the moral ambiguity of 'care.' This finding provides insight into the social mechanisms that support technological solutionism [61], providing one explanation for why technologists seek to displace previous practices with algorithmic tools to solve problems [11, 20].

Second, in constructing algorithmic infrastructure to staff open shifts, technologists articulated how distinctive aspects of algorithms are framed with regard to particular moral frameworks. While technologists associated metrics and measurement with efficiency and performance, they also discussed the matches that algorithms make in terms of intimate relationships. This finding demonstrates that the use of algorithms is justified through multiple moral frameworks. They are ambiguous artifacts with multiple interpretations [47]. The consequence is that the moral foundations of algorithm design must be analyzed as they are entangled with the specific practices, ideologies, and contexts that shape them.

Third, the variable meanings ascribed to the concept of care impede technologists' insight into the lived experiences of caregivers and care coordinators. Our three-dimensional investigation of staffing algorithms reveals that technologists prioritize efficiency, which sometimes compromises caregiver job quality and the experience of coordinators and care recipients. Put differently, technologists' pursuit of one type of good stifles efforts toward others—a phenomenon that Thévenot refers to as 'structural tyranny' [74]. While care carries a variety of meanings, technologists do not treat interpretations of the term equally when it comes to implementing algorithms. This finding emphasizes the need to not only characterize morally-charged terms [17], but also attend to how hierarchies of interpretation emerge across contexts [51], their consequences for on-the-ground implementation [49], and how they maintain an unfavorable status quo [23]. Thus, one direction for future scholarship is the study of moralization and its consequences for different actors.

5.1 Limitations

Several aspects of the study design limit the conclusions that can be drawn about the impact of algorithmic decision-making on the home care industry. Platforms for care work take a variety of forms. While CareTech employs caregivers directly and staffs shifts with algorithms, other care work platforms encourage (formalized) employment relationships between caregivers and families [76]. Future work could engage in a comparative study of these platforms. Nevertheless, CareTech stands out as one of the largest private pay home care providers in the United States and is working to achieve further growth in the sector; as other firms enter the industry, they may imitate CareTech's organizational practices [21, 29].

In addition, we critically reflect on the caveats of our conceptual approach. One possible critique of the EoW framework is its compatibility with moral relativism [41], contributing to difficulty in judging right from wrong and an inability to critique harmful practices. However, a vital dimension of this framework is the positioning of ordinary actors (i.e., technologists, caregivers, care coordinators) as capable of making normative judgments by drawing on *legitimate* moral frameworks. Moreover, we use the framework as an analytical tool to study the moral reflections of participants as they interact with algorithms. This approach enables inquiry into the social mechanics of moral values and the changing contexts in which they exist. In addition, the framework has been critiqued for its lack of focus on power and oppression. While it is true that power relations are not the main focus of our conceptual approach, the EoW framework was introduced as a corrective to sociological studies that focus almost exclusively on power relations [7]. Moreover, we used the EoW framework to unveil asymmetries and challenges that emerge from structural tyranny.

6 CONCLUSION

In this paper, we analyzed the construction and impact of care staffing algorithms. To coordinate action in the context of multiple demands and expectations, technologists mobilized several moral frameworks (e.g., market, industrial, civic, domestic), exploited various meanings of 'care,' (e.g., increasing the size of the caregiving workforce, making care accessible through gains in efficiency, improving caregivers' status in society) and imbued algorithms with multiple moral meanings (e.g., as means to increase efficiency, improve job quality, facilitate intimate relationships). Against technologists' promises of a fairer, more transparent order, we found the implementation of algorithms heightened ambiguity for caregivers and coordinators. Algorithmic staffing practices obscured caregivers' insight into care recipients' experiences and blurred boundaries between work and personal time, while coordinators described feelings of ambivalence.

While our study unpacks the care practices that shape—and are shaped by—algorithms, we also make a theoretical contribution. In introducing Boltanski and Thévenot's economies of worth (EoW) framework, we emphasize the significance of the study of morality for the FAccT community. By focusing our investigation on issues beyond the explicit context of ethics, we contribute to the development of new ways to understand how technology professionals make decisions. As a conceptual tool, the study of moral narratives and terms provides insight into the ideology of technological solutionism, demonstrates that algorithms are imbued with moral meanings, and highlights how cultural concepts (e.g., harm, safety, accountability) are interpreted and operationalized differently across contexts. At least in our case, hierarchies emerge when these concepts are operationalized. Future work should investigate these topics seriously to understand the role that morality plays as it intersects with other dynamics that shape the impact of algorithmic technologies on the social world.

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