Beyond Efficiency: Labor Process Restructuring and Its Consequences in Platform Algorithm Management — A Grounded Theory Study

Prof. Hsiensheng Hsiao

Department of Technology Application and Human Resource Development,

National Taiwan Normal University, Taipei City, Taiwan

PhD student Huichu Kao

Department of Technology Application and Human Resource Development, National

Taiwan Normal University, Taipei City, Taiwan

Abstract

With the rise of platform capitalism, platform economy have reshaped the contemporary labor relation through algorithmic management and piece-rate payment systems. This study aims to examine how algorithmic control operationalizes capital's pursuit of efficiency maximization and to analyze how such mechanisms contribute to the deskilling, fragmentation, and dehumanization of the labor process.

Adopting a Grounded Theory approach, this research conducted in-depth interviews with platform delivery workers. Through the procedures of open coding, axial coding, and selective coding, three core themes were identified: platform labor risk, the gap between labor conditions and institutional protection, and constraints on union participation and the weakening of collective action.

The findings suggest that platforms transfer operational risks to individual workers through technologically mediated management systems. As a result, delivery workers are increasingly trapped in conditions characterized by extended working hours and forms of self-exploitation.

Keywords: platform economy, gig workers, algorithmic management

1.Introduction

In recent years, the rapid expansion of digital platforms has profoundly transformed the organization of work and employment relations. The rise of platform capitalism, as conceptualized by Nick Srnicek, has created new forms of economic coordination in which digital platforms act as intermediaries connecting consumers, service providers, and data infrastructures. Within this model, labor is increasingly organized through on-demand, flexible arrangements rather than traditional employment contracts. While such systems promise efficiency and flexibility, they also restructure labor relations by shifting operational risks and uncertainties from organizations to individual workers. As a result, many workers operating within platform economies face unstable income streams, fragmented tasks, and weakened institutional protections.

A growing literature has emphasized the central role of algorithmic management in governing labor within digital platforms. Scholars such as Alex Rosenblat and Luke Stark argue that platform companies increasingly rely on data-driven systems to allocate tasks, monitor performance, and evaluate workers through automated decision-making processes. Through rating mechanisms, automated dispatch systems, and real-time data monitoring, algorithmic management introduces a technologically mediated form of labor control that differs from traditional managerial supervision. Although these technologies are often framed as neutral tools for efficiency optimization, existing research suggests that they may intensify labor discipline, reduce worker autonomy, and contribute to the deskilling and fragmentation of the labor process (Mendonça&Kougiannou,2022).

The broader social implications of such transformations have been discussed through the concept of the precariat, introduced by Guy Standing. Standing (2011) argues that the precariat represents an emerging social class characterized by unstable employment, insecure income, and limited access to social protection. Individuals situated within precarious employment arrangements often experience chronic uncertainty that constrains their ability to make long-term life plans. Instead, they are compelled to prioritize short-term survival by accepting any available employment opportunities. Over time, such conditions may generate feelings of social alienation, diminished civic participation, and weakened collective identity. Moreover, workers in precarious employment frequently lack stable contracts, career development opportunities, and institutional channels through which they can express grievances or advocate for their rights.

Despite the growing literature on platform capitalism, algorithmic management, and precarious labor, relatively limited research has examined how these structural dynamics are experienced and interpreted by workers themselves, particularly within the context of platform-based delivery work. Delivery workers represent one of the most visible forms of gig labor in contemporary platform economy yet their everyday experiences of algorithmic control, labor risk, and institutional exclusion remain insufficiently explored. In particular, there is a need for qualitative research that captures how workers perceive the shifting boundaries of employment relations and how these perceptions shape their strategies for coping with precarious working conditions.

To address this gap, this study adopts a Grounded Theory approach to investigate the labor experiences of platform delivery workers. Through in-depth interviews with delivery workers, this research explores how algorithmic management reshapes the labor process and how workers interpret the risks and uncertainties embedded in platform-mediated work. By systematically analyzing interview data through open coding, axial coding, and selective coding, this study identifies key themes related to platform labor risk, the gap between labor conditions and institutional protection, and the weakening of collective action among platform workers. The study contributes to the literature on platform labor by providing a theoretically grounded account of how algorithmic governance restructures labor processes and social relations within the emerging platform economy.

2. Literature Review

Since the 2008 global financial crisis, digital platforms have increasingly become central to contemporary capitalism, giving rise to what scholars describe as platform capitalism (Haidar & Keune, 2021; Srnicek, 2017). In this model, platforms are not merely neutral intermediaries but function as organizational forms that extract value by coordinating transactions, capturing data, and externalizing labor costs and risks to workers (Srnicek, 2017). From this perspective, platform capitalism represents a new phase of accumulation in which labor relations are restructured through digital infrastructures, contractual ambiguity, and weakened institutional protections (Haidar & Keune, 2021).

Within this macro-level transformation, algorithmic management has emerged as the core mechanism through which labor is governed. Algorithmic management refers to systems in which decision-making, monitoring, and evaluation functions are delegated to self-learning algorithms, thereby reducing the need for direct human supervision (Duggan et al., 2020; Lee et al., 2015). Kellogg et al. (2020) conceptualize algorithmic control through the "6R" framework (restricting, recommending, recording, rating, replacing, and rewarding) demonstrating how platforms exert granular and continuous control over workers. These mechanisms suggest that algorithmic management should not be viewed as a neutral technological tool but rather as a managerial regime that reorganizes authority, visibility, and worker dependence (Kellogg et al., 2020).

A central debate in this literature concerns the autonomy paradox, which highlights the tension between perceived flexibility and actual control (Mazmanian et al., 2013; Möhlmann & Zalmanson, 2017). Although platforms emphasize autonomy and flexibility, empirical evidence indicates that workers remain subject to continuous monitoring, opaque algorithmic rules, and information asymmetries that constrain meaningful autonomy (Möhlmann & Zalmanson, 2017). While the autonomy paradox was originally developed in the context of knowledge workers, it has been widely applied to platform labor to explain why nominal independence coexists with heightened dependence on platform systems (Mazmanian et al., 2013).

Building on this, scholars increasingly characterize platform labor as a form of digital Taylorism, in which labor processes are decomposed, standardized, and optimized through data-driven management (Altenried, 2020; Kellogg et al., 2020). Algorithmic systems break down tasks into micro-units, minimize worker discretion, and intensify performance

monitoring, thereby facilitating efficiency while simultaneously contributing to deskilling and fragmentation of the labor process (Altenried, 2020). In such contexts, workers are reduced to functional components within algorithmic systems, limiting opportunities for skill accumulation and weakening occupational identity.

Beyond labor control, a growing body of research highlights the precarization of platform work. Platform labor is frequently associated with unstable income, limited career progression, lack of social protection, and heightened exposure to economic and physical risks (Wood et al., 2019; Haidar & Keune, 2021). These risks are not incidental but are structurally embedded within platform capitalism, as platforms shift operational costs and uncertainties onto individual workers while maintaining control over labor processes (Haidar & Keune, 2021). In this sense, flexibility is institutionally produced through the withdrawal of employer responsibility, resulting in a labor regime characterized by insecurity and risk externalization (Wood et al., 2018).

Despite these important contributions, the existing literature presents several limitations. First, studies tend to focus either on the macro-level political economy of platforms or on the micro-level mechanisms of algorithmic control, with relatively limited integration across analytical levels. Second, while deskilling and precarity are widely acknowledged, fewer studies examine how workers themselves interpret the interconnections between work-related risks, institutional protection gaps, and weakened collective action. Third, much of the literature relies on conceptual or survey-based approaches, with comparatively less emphasis on grounded, qualitative analyses that capture workers' lived experiences in specific contexts such as platform-based food delivery.

To address these gaps, this study adopts an integrated analytical framework linking platform capitalism, algorithmic management, and labor process transformation. It argues that algorithmic management operates as a form of capital control that simultaneously intensifies efficiency demands, fragments labor processes, and transfers risks to workers. By employing a grounded theory approach to examine platform delivery workers' experiences, this study seeks to extend existing research beyond the autonomy-flexibility narrative and provide a more comprehensive understanding of how algorithmic control reshapes work risks, institutional protections, and collective labor dynamics.

3. Method

3.1 Sample and Procedure

The interview participants were selected using purposive sampling to ensure that individuals with direct experience in platform-based food delivery work were included in the study. The sample consists of five delivery workers from different platforms, employment statuses, and demographic backgrounds, enabling the study to capture diverse perspectives on platform labor and working conditions.

Table 1. Demographic Characteristics of Interview Participants

Participant	Gender	Age	Education	Platform Company	Employment Status	Delivery Experience
A	Male	29	High School	Foodpanda	Full-time	1 year
B	Female	37	Junior College	Foodpanda	Full-time	2 years
C	Male	25	Bachelor's Degree	Uber Eats	Part-time	6 months
D	Male	20	Bachelor's Degree	Uber Eats	Part-time	1 year
E	Male	46	Junior College	Deliveroo	Full-time	2 years

3.2 Measures

This study primarily adopts a Grounded Theory approach to collect and analyze research data. Grounded Theory was originally proposed by Barney Glaser and Anselm Strauss in 1967. The approach provides a systematic framework for developing theory that is grounded in empirical data collected within the social context of the research setting. Rather than beginning with predetermined hypotheses, Grounded Theory emphasizes the iterative process of data collection and analysis in order to generate theoretical insights from participants' experiences.

Subsequently, Anselm Strauss and Juliet Corbin (1990) further refined the methodological procedures of Grounded Theory in their influential work Basics of Qualitative Research: Grounded Theory Procedures and Techniques. Their framework translated the original principles of Grounded Theory into a set of practical analytical procedures that enable researchers to systematically analyze qualitative data and construct theoretical interpretations.

In this study, semi-structured interviews were conducted to obtain in-depth insights into the experiences of platform food delivery workers. The semi-structured interview format allowed the researchers to adjust the direction and content of interview questions based on the specific circumstances of each interview, thereby enabling the collection of rich and detailed qualitative data.

Regarding data collection procedures, all interviews with platform delivery workers were audio-recorded with the participants' consent. During the interview process, the researchers also adjusted the wording of questions according to the conversational context and, when necessary, posed additional questions related to the research topic in order to clarify participants' responses and explore emerging themes. After the interviews were completed, the audio recordings were transcribed into textual data. Throughout this process, the researchers sought to maintain an objective and neutral stance while faithfully representing the narratives and experiences of each participant.

For data analysis, the interview transcripts were analyzed following the three-stage coding procedures proposed by Anselm Strauss and Juliet Corbin (1990), including open coding,

axial coding, and selective coding. Through this systematic coding process, the study identifies key themes emerging from the interview data and develops theoretical insights into how algorithmic management mechanisms shape the labor process in platform work, particularly in terms of deskilling, fragmentation, and dehumanization of labor.

3.3 Analysis

Proposition A: Work Risks in Platform Labor

This study investigates the occupational risks associated with platform-based delivery work through in-depth interviews with platform delivery workers. Following the analytical procedures of Grounded Theory, the interview data were first subjected to open coding, through which key concepts related to work risk were extracted from participants' narratives. Subsequently, axial coding was conducted to integrate related concepts into broader thematic categories. Finally, selective coding was employed to identify the core category that captures the central pattern emerging from the data.

The findings indicate that platform delivery work involves substantial traffic-related and occupational safety risks. Many participants reported having experienced traffic accidents, hazardous road conditions, or other unexpected dangers while performing delivery tasks. These risks include minor collisions with other vehicles, slipping on wet roads during rainy weather, and sudden encounters with animals or other road hazards. Such incidents highlight the inherently risky nature of delivery work conducted within fast-paced urban traffic environments.

In addition to transportation-related risks, some respondents also raised concerns about personal safety during interactions with customers. For example, several female delivery workers expressed apprehension about entering customers' residential spaces, where they feared the possibility of harassment or other unsafe situations. These experiences suggest that the occupational risks faced by delivery workers extend beyond traffic hazards and also involve interpersonal safety concerns.

Furthermore, the level of work risk is closely associated with the time pressure and work organization characteristic of platform delivery systems. Delivery workers are often required to complete tasks within strict time constraints imposed by platform algorithms and customer expectations. Such time pressure may encourage risk-taking behaviors in traffic, thereby increasing the likelihood of accidents. At the same time, many delivery workers operate as independent contractors or self-employed service providers, which means that they often lack comprehensive occupational accident protection and institutional safeguards.

Based on the analysis of the interview data, this study proposes Proposition A: Work Risks in Platform Labor. The findings suggest that while platform-based work arrangements provide flexibility and income opportunities, they simultaneously expose workers to heightened occupational risks and safety vulnerabilities within the platform economy.

Table 2. Coding Structure of Work Risks in Platform Labor

Open Coding	Axial Coding	Selective Coding
Traffic collisions during delivery	Traffic accident risks in delivery work	Work risks in platform labor
Slipping while riding in rainy weather		
Dangerous situations caused by unexpected road conditions		
Falling from a motorcycle during delivery		
Sudden animal crossings causing hazards		
Need for rapid delivery during work	Time pressure increases work risks	
Each order must be completed within 30 minutes		
Long-term vehicle use leading to wear and tear	Equipment deterioration risks	
Frequent motorcycle maintenance required		
Female delivery workers concerned about customer harassment	Safety concerns in customer interactions	
Avoidance of entering customers' residences		
Long hours of riding during delivery work	Health burdens caused by long working hours	
Repetitive movements potentially causing injuries		

Analysis of the interview data indicates that platform-based delivery work is characterized by a high level of occupational risk, with traffic-related hazards emerging as the most prominent concern. Most participants reported experiencing varying degrees of road accidents or potentially dangerous situations while performing delivery tasks. Because delivery workers must spend extended periods riding motorcycles or bicycles in dense urban traffic environments, traffic safety becomes one of the most common sources of work-related risk.

For example, Participant A described having experienced a minor traffic collision while delivering orders:

"There was a minor collision once. A car behind me suddenly rushed out and hit me. Fortunately, I wasn't seriously injured."

(Participant A)

Although such incidents may not always result in severe injuries, they illustrate how delivery workers are routinely exposed to high-risk traffic environments during their

daily work activities. Similarly, Participant C mentioned that weather conditions can significantly increase the likelihood of accidents:

"It happened once. I slipped while riding my motorcycle in the rain and scratched the bike. It was really upsetting."
(Participant C)

This example demonstrates that, in addition to ordinary traffic hazards, environmental factors such as adverse weather conditions may further increase the risk of accidents during delivery work.

Furthermore, several respondents noted that unexpected road situations frequently occur during deliveries. Participant B described a sudden encounter with an animal while riding in a narrow alley:

"Once I was riding through an alley when a cat suddenly ran out. I tried to avoid it and almost crashed into a motorcycle parked on the roadside."
(Participant B)

Such incidents indicate that delivery workers must constantly respond to unpredictable road conditions, which introduces additional uncertainty and danger into their work processes.

In addition to traffic-related risks, some participants also raised concerns regarding personal safety during interactions with customers. Participant B explained that she had heard of female delivery workers experiencing sexual harassment when entering customers' residences, which made her cautious about entering private spaces during deliveries:

"I once heard another female courier mention that she was asked to bring the food upstairs and ended up being sexually harassed. That's really scary. As a woman, I try to avoid going into customers' homes whenever possible."
(Participant B)

This situation suggests that platform delivery work involves not only transportation-related risks but also potential safety concerns arising from interpersonal interactions with customers.

Moreover, time pressure associated with delivery platforms may further amplify occupational risks. Participant A noted that delivery platforms typically impose strict time limits for completing delivery tasks:

"I ride around the city all day, and each order has to be completed within 30 minutes. The motorcycle wears out quickly, and I often have to repair it."
(Participant A)

These time constraints may increase the likelihood of traffic accidents by encouraging faster riding speeds. At the same time, the constant use of work equipment—such as motorcycles—can lead to significant wear and maintenance costs, placing additional economic burdens on delivery workers.
Nevertheless, a small number of participants believed that accident risks could be minimized through careful riding behavior. For instance, Participant D stated:

"So far, I haven't had any traffic accidents. As long as you ride carefully and take it slow, it should be fine."
(Participant D)

This perspective suggests that some workers tend to interpret occupational risk as an individual responsibility, rather than as a structural problem embedded within platform work arrangements.

Overall, the interview findings reveal that platform delivery workers commonly face multiple forms of occupational risk, including traffic accidents, unexpected road hazards, and safety concerns during customer interactions. In addition, strict delivery deadlines and high-frequency riding further intensify traffic safety risks and contribute to equipment deterioration.

These findings suggest that although platform labor offers a degree of flexibility, it simultaneously exposes workers to highly uncertain and potentially hazardous working environments. Therefore, this study argues that delivery workers must bear multiple work-related risks while performing platform-mediated delivery services. Such risks are closely associated with the institutional arrangements and organizational logic of platform labor systems.

Taken together, these findings support Proposition A: Work Risks in Platform Labor, which posits that platform delivery workers are exposed to elevated levels of traffic-related and occupational safety risks, and that the organizational structure of platform labor further intensifies these risks.

Proposition B: The Gap Between Labor Conditions and Institutional Protection in Platform Labor

The coding analysis presented in Table 2 reveals a structural gap between the labor conditions experienced by platform delivery workers and the institutional protections available to them. Based on the grounded theory coding process, several patterns emerge from the interview data that collectively support Proposition B.

First, the open coding results indicate that full-time delivery workers frequently engage in long working hours in order to maintain a stable income. Many participants reported working more than eight hours per day, with some averaging approximately ten hours of work daily and working up to six days per week. In some cases, platform scheduling systems allow workers to remain available for more than twelve hours per day. These patterns suggest that extended working hours have become a common feature of platform-based delivery work.

Second, the data reveal the emergence of a self-exploitative labor pattern. Several respondents noted that when the number of available orders decreases, they compensate by increasing their working hours or accepting more delivery tasks in order to maintain their income levels. In addition, reductions in delivery fees and intense competition among delivery workers further intensify this dynamic. Because workers must also deduct operational costs such as fuel expenses and vehicle maintenance from their earnings, income instability becomes a persistent concern. As a result, workers often feel compelled to increase their labor input in order to secure a minimally sustainable income.

Third, the coding results highlight a lack of institutional social protection for platform delivery workers. Interview data show that platform companies typically do not provide labor insurance coverage, retirement pension contributions, or unemployment insurance for delivery workers. Consequently, workers must bear economic risks individually, including income fluctuations, occupational hazards, and unexpected work interruptions. This absence of formal social protection mechanisms further widens the gap between workers' labor contributions and the institutional safeguards available to them.

Finally, the coding analysis also reveals a tension between labor flexibility and institutional protection. While some full-time delivery workers expressed a desire for labor insurance coverage and stronger labor rights protections, part-time workers tended to prioritize income flexibility and were less supportive of restrictions on working hours. This divergence illustrates the complex relationship between flexibility and protection within platform labor arrangements.

Taken together, these findings indicate that platform delivery workers operate within a labor system characterized by long working hours, income instability, and limited institutional protection. In the absence of formal labor protections, workers often rely on extending their working hours and increasing order volume in order to sustain their income. This process generates a labor pattern marked by long hours and self-exploitation.

Table 3. Coding Structure of The Gap Between Labor Conditions and Institutional Protection in Platform Labor

Open Coding	Axial Coding	Selective Coding
Full-time delivery workers work more than 8 hours per day	Long working hours in platform labor	Gap between labor conditions and institutional protection in platform labor
Average daily working time is about 10 hours		

Open Coding	Axial Coding	Selective Coding
Working six days per week		
Delivery workers can schedule shifts exceeding 12 hours		
Extending working hours to increase income	Self-exploitative labor pattern	
Longer working hours required when order volume declines		
Declining delivery fees reduce income	Income instability	
Intense competition among delivery workers		
Income must cover fuel and operational costs		
Platforms do not provide labor insurance	Lack of social protection systems	
No employer contribution to labor pension funds		
No employment insurance or unemployment benefits		
Delivery workers must bear economic risks themselves		
Full-time workers hope to obtain labor insurance protection	Demand for labor rights	
Part-time workers value income flexibility		
Workers do not want restrictions on working hours	Tension between labor flexibility and institutional protection	

The interview data indicate that although platform delivery work provides a certain degree of flexibility, delivery workers commonly face long working hours and unstable income under actual labor conditions. Because most platforms classify delivery workers as independent contractors, they are not subject to labor regulations concerning working hours and rest periods. As a result, delivery workers are formally free to determine their working time, but in practice their working patterns are strongly influenced by income pressure and platform order-allocation mechanisms.

During the interviews, most full-time delivery workers reported working more than eight hours per day. Participant A stated:

"I currently work as a full-time delivery worker. In this job, shifts can be scheduled for up to 16 hours a day. Right now I usually schedule about 10 hours per day and work six days a week."

(Participant A)

Another full-time delivery worker, Participant E, similarly noted:

"At present, I work about 11 hours per day on average and do deliveries six days a week."
(Participant E)

These responses indicate that full-time delivery workers often need to work long hours in order to maintain a stable level of income. In contrast, part-time delivery workers tend to work fewer hours. For example, Participant C explained:

"I have a full-time job at a television station. On average I do delivery work for about four hours a day, five days a week."
(Participant C)

Similarly, Participant D reported:

"Currently I work about three hours a day and do deliveries four days a week."
(Participant D)

However, even with long working hours, some full-time delivery workers remain dissatisfied with their income. Participant A commented:

"If the company doesn't run free-delivery promotions, and with the current number of orders and the company constantly recruiting new drivers to compete for orders, after deducting fuel costs and second-generation health insurance contributions, I earn less than NT$25,000 per month."
(Participant A)

Participant E also noted that income has declined due to an increase in the number of delivery workers and adjustments to the platform's payment system:

"Although the company guarantees a basic hourly wage, the number of orders keeps decreasing. To earn more than NT$50,000 per month, I have to schedule more working days."
(Participant E)

These findings indicate that delivery workers' income is highly dependent on the number of orders received and the amount of working time invested. As a result, some workers must extend their working hours in order to maintain their income levels, thereby creating what can be described as a self-exploitative labor pattern.

At the same time, because platform companies typically define delivery workers as independent contractors, these workers generally do not receive labor insurance, pension contributions, or employment insurance benefits. All interview participants indicated that the platforms did not provide labor insurance coverage or contribute to labor pension funds, leaving delivery workers without basic protection in cases of unemployment or retirement.

Some respondents therefore believed that they should be regarded as regular employees of the platform. Participant A stated:

"I think I am essentially a full-time employee of the platform. The company should contribute to my labor pension and labor insurance."
(Participant A)

Similarly, Participant B expressed concerns about the lack of income security if the platform were to cease operations:

"If the company shuts down, there will be no income at all. Of course I hope there would be unemployment benefits during the transition period."
(Participant B)

However, some respondents also expressed concerns that excessive institutional regulation might limit their earning opportunities. Participant E explained:

"I don't want a 12-hour cap on working hours. The economy is bad, and people need to work hard to earn money. Setting a working-hour limit would cut off people's livelihood."
(Participant E)

These interview results suggest that platform delivery workers face a tension between labor protection and work flexibility. On the one hand, workers hope to obtain basic social protections such as labor insurance or unemployment benefits. On the other hand, they wish to maintain a high degree of work flexibility so that they can increase their income by extending their working hours.

Overall, the interview analysis reveals that platform delivery workers generally lack minimum labor standards and social protection under the current institutional arrangements. Consequently, they must rely on extending working hours and increasing the number of orders to maintain their income. This pattern of long working hours combined with unstable income may not only affect the physical and mental well-being of delivery workers but may also generate broader long-term implications for labor market conditions.

Proposition C: Constrained Union Participation and the Weakening of Collective Action among Platform Workers

With regard to the protection of workers' rights to participate in trade unions, this study focuses on whether platform delivery workers have joined unions, the reasons for non-membership, and their expectations regarding the potential role of unions in the future. The interview findings reveal that none of the five participants had joined a trade union, suggesting generally low levels of union participation among platform delivery workers.

Further analysis indicates that the reasons for non-membership are multifaceted rather than attributable to a single factor. These reasons include limited understanding of union functions, distrust toward union organizations, concerns about the costs of union

membership, and a low sense of occupational attachment associated with part-time work. Some participants perceived that the primary function of unions was merely to assist with enrollment in labor insurance programs and that unions were unable to substantially improve wages or benefits. Consequently, they considered union membership to offer limited practical value. Other participants expressed concerns regarding the potential lack of transparency in the relationship between unions and platform companies, and some even suspected that platform representatives might infiltrate unions, thereby reducing their willingness to participate.

At the same time, although most participants had not joined unions, their expectations regarding union functions remained relatively clear. Many respondents indicated that unions should possess the ability to negotiate wages with platform companies, advocate for labor welfare, and represent delivery workers' interests. This suggests that delivery workers do not entirely reject the idea of unions but rather hold reservations regarding the credibility, effectiveness, and representativeness of existing union organizations.

Moreover, the organizational characteristics of platform labor itself contribute to the weakening of collective action. Platform-based delivery work is typically characterized by high levels of labor fragmentation, individualized task allocation, and limited interaction among workers. These structural conditions make it difficult for delivery workers to develop stable social ties or a shared collective identity. In addition, the high proportion of part-time workers and the high degree of labor mobility further weaken solidarity and the potential for collective mobilization.

Based on the analysis of the interview data, this study proposes Proposition C: Constrained Union Participation and the Weakening of Collective Action among Platform Workers. According to the coding results derived from the Grounded Theory analysis, the following proposition is proposed:

Platform workers' willingness to participate in unions is constrained by limited trust in unions, insufficient understanding of union functions, and the fragmented nature of platform labor, which produces weak occupational attachment and dispersed worker interactions. These factors collectively reduce workers' incentives to join unions and weaken the potential for collective action aimed at improving labor conditions.

Table 4: Coding Structure of Union Participation among Platform Delivery Workers

Open Coding	Axial Coding	Selective Coding
None of the participants joined a union	Low union participation	Constrained union participation and weakened collective action among platform workers
Belief that joining a union is unnecessary		
Part-time employment reduces willingness to join		
Lack of knowledge about union functions	Limited understanding of union functions	

Open Coding	Axial Coding	Selective Coding
Perception that unions only assist with labor insurance enrollment		
Belief that unions have limited practical functions		
Concerns that unions may be infiltrated by platform companies	Distrust toward unions	
Fear that speaking in unions may be reported to the company		
Lack of trust in the integrity of union leadership		
Perception that union membership fees are expensive	Cost considerations of union membership	
Doubts about receiving actual benefits after paying fees		
Expectation that unions should negotiate wages	Expectations regarding union representation and bargaining	
Expectation that unions should advocate for labor insurance and unemployment benefits		
Expectation that unions should secure benefits similar to those of regular employees		
Platform work limits interaction among workers	Difficulty forming worker solidarity	
Ambiguous worker status reduces collective identity		
High proportion of part-time workers weakens sense of belonging		

The interview data indicate that platform delivery workers generally do not join trade unions and tend to express relatively low levels of trust toward union organizations. Some participants expressed concerns regarding the transparency of relationships between unions and platform companies, and even suspected that unions might serve as an extension of corporate surveillance. For instance, Participant A stated:

"I haven't joined a union. I heard that the union was founded by people connected to the company, and that there might be company insiders pretending to be delivery workers. I worry that if I say something in the union, it could be reported back to the company."
(Participant A)

Such statements suggest that concerns regarding union autonomy and confidentiality have become important factors discouraging delivery workers from participating in union activities.

In addition to distrust, some respondents believed that unions provide limited practical benefits. Participant B noted:

"I haven't joined a union. You have to pay membership fees, and if the only reason to join is to enroll in labor insurance, I don't think it's necessary."
(Participant B)

Similarly, Participant C stated:

"I haven't joined a union. It feels like joining a union doesn't really do much."
(Participant C)

These responses indicate that some delivery workers perceive unions primarily as institutions related to labor insurance enrollment, rather than organizations capable of improving collective labor conditions.

Part-time employment also appears to reduce incentives for union participation. Participant D explained:

"It's just a part-time job. If things don't work out, I can simply stop doing it. There's no need to join a union."
(Participant D)

This perspective reflects the relatively low level of occupational attachment among part-time delivery workers, which reduces their motivation to invest in long-term union participation.

In addition, some respondents raised concerns regarding the governance and credibility of union organizations. Participant E commented:

"I haven't joined a union. The integrity of union leaders is very important. The monthly fees are not cheap, and even if you pay them, it's not guaranteed that you will receive labor insurance benefits."
(Participant E)

This suggests that the credibility and financial transparency of union leadership may also influence workers' willingness to join.

Despite these concerns, delivery workers still expressed clear expectations regarding the potential role of unions. Many participants believed that unions should be capable of negotiating wages with platform companies and advocating for workers' rights. Participant A stated:

"I expect unions to fight for delivery workers' rights to negotiate wages, so that the platform cannot cut pay whenever it wants."
(Participant A)

Participant B emphasized the importance of labor welfare:

"I expect unions to help delivery workers obtain the benefits that employees should have, such as labor insurance or unemployment benefits."
(Participant B)

Similarly, Participant E added:

"I hope unions can help delivery workers obtain the same benefits as regular employees, such as overtime pay and unemployment subsidies."
(Participant E)

These interview results indicate that delivery workers' expectations of unions center primarily on representation and bargaining power, namely the ability to act as an intermediary organization capable of negotiating with platform companies on behalf of workers.

Overall, the findings suggest that the absence of union membership among platform delivery workers does not necessarily indicate a lack of demand for collective representation. Instead, it reflects the structural constraints associated with platform labor, including distrust toward unions, limited awareness of union functions, cost considerations, and weak collective identity among workers. Under the platform-based task allocation system, delivery workers have limited opportunities for interaction with one another, while the high proportion of part-time employment further reduces their sense of belonging.

These structural conditions make it difficult for delivery workers to establish collective organizations or mobilize collective solidarity. Consequently, the platform labor system not only constrains workers' ability to exercise their rights to union participation but also weakens their capacity to engage in effective collective action when negotiating with platform companies.

Based on the above propositions and illustrative cases, this study employed selective coding to construct a coherent storyline. Accordingly, the core category of the research findings was identified and visually represented in a conceptual framework, as shown in Figure 1.

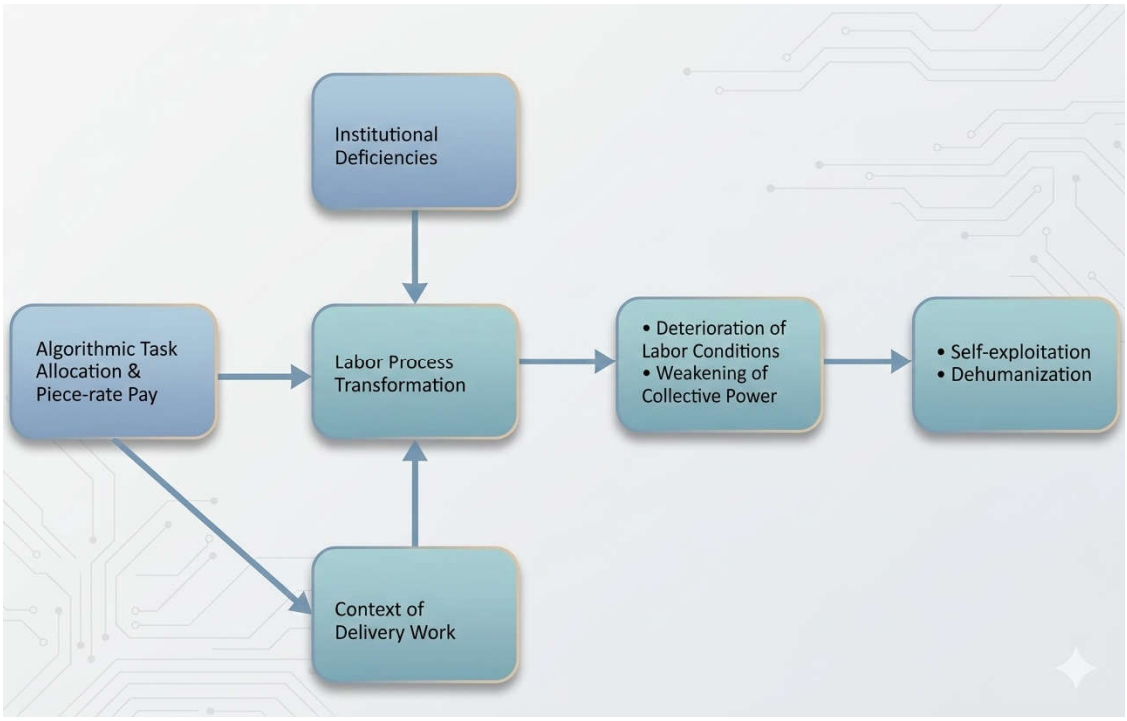

Figure 1 The paradigm model (Strauss and Corbin ,2008)

4. Theory Triangulation

To enhance the analytical depth and theoretical explanatory power of this study, we adopted theory triangulation during the data analysis process. Rather than relying on a single theoretical perspective to interpret the labor conditions of platform delivery workers, the study simultaneously draws on platform capitalism, labor market theory, and psychological contract theory to analyze the empirical findings. By examining the data through multiple theoretical lenses, the study seeks to cross-validate interpretations and avoid the limitations associated with a single theoretical framework. This approach enables a more comprehensive understanding of platform workers' experiences by examining the phenomenon at multiple levels, including institutional structures, labor relations, and individual perceptions.

First, from the perspective of platform capitalism, platform companies utilize digital technologies and algorithmic management systems to classify delivery workers as "partners" or independent contractors. While this classification appears to grant workers a high degree of flexibility and autonomy, platforms simultaneously exercise substantial control over the labor process through mechanisms such as order-allocation algorithms, reward and penalty systems, rating mechanisms, and peer reporting systems. These arrangements allow platform companies to avoid the responsibilities associated with formal employment relationships—such as providing labor insurance, pension contributions, occupational accident compensation, and working-hour protections—while still maintaining effective managerial control over workers. Interview data indicate that delivery workers must remain on standby for long periods, maintain high order-acceptance rates, and comply with platform rules in order to secure sufficient income. These findings reflect a characteristic feature of platform capitalism in which technological mediation is

used to disguise and legitimize forms of labor control while simultaneously transferring operational risks and costs to workers.

Second, from the perspective of labor market theory, the situation of platform delivery workers reflects the characteristics of nonstandard employment and secondary labor markets. Delivery work is typically associated with unstable income, limited career development opportunities, lack of promotion prospects, and minimal social protection. Workers are required to bear risks related to income fluctuations, work interruptions, and potential accidents. These characteristics closely resemble the conditions described in labor market segmentation theory, where workers in the secondary labor market occupy marginal positions characterized by low security, high turnover, and limited institutional protection. When combined with Guy Standing's concept of the precariat, the empirical findings further illustrate how delivery workers may gradually become trapped in a form of precarious labor characterized by long working hours, low security, weak occupational identity, and limited channels for collective representation. In other words, platform delivery workers not only experience unstable labor conditions but also face structural labor insecurity that constrains their ability to develop long-term career plans.

Third, from the perspective of psychological contract theory, although platform companies and delivery workers do not establish formal employment relationships, an implicit exchange relationship still exists between the two parties. Many delivery workers initially join platform work based on expectations of high earnings through effort, flexible working arrangements, and attractive commission-based incentives. These expectations form a psychological contract regarding fair compensation, organizational support, and equitable treatment. However, when platforms unilaterally modify compensation structures, increase the number of delivery workers—thereby intensifying competition for orders—or fail to provide adequate protection when workers encounter occupational risks, delivery workers may perceive a psychological contract breach. Such discrepancies between expectations and reality can increase distrust and reduce workers' identification with the platform. Consequently, delivery workers are more likely to view platform work as a temporary livelihood strategy rather than a long-term career path. Interview participants also frequently expressed limited confidence in government regulations, unions, and institutional protections, which may reflect a broader sense of disillusionment and alienation arising from unmet expectations within the institutional environment.

In summary, the application of theory triangulation demonstrates that the labor conditions of platform delivery workers cannot be fully explained by a single theoretical framework. The perspective of platform capitalism reveals how digital technologies and institutional arrangements enable platforms to exert control while transferring risks to workers. Labor market theory helps explain why delivery workers occupy marginal and insecure positions within the labor market. Psychological contract theory further illustrates how discrepancies between expected flexibility and actual labor conditions generate feelings of imbalance, distrust, and weak organizational identification among workers. By integrating these three theoretical perspectives, this study provides a more comprehensive understanding of platform workers' occupational risks, institutional protection gaps, and subjective experiences, thereby strengthening the theoretical validity and explanatory power of the research findings.

5. Result

This study investigate that algorithmic management within the platform economy is not merely a neutral technological tool but rather represents a new form of capital control over labor. The key findings of this research can be summarized in three main aspects.

First, algorithmic systems create a form of "panoptic" and dehumanized control over the labor process. Through AI-based order allocation and large-scale data monitoring, platforms are able to implement highly granular management of workers' activities. This system prioritizes ideals of "perfect attendance" and "maximum efficiency," reducing delivery workers or service providers to a series of performance metrics and numerical indicators. In doing so, algorithmic management often disregards workers' human judgment and situational discretion when confronting complex circumstances, such as caregiving responsibilities, unexpected traffic incidents, or other real-life contingencies.

Second, the platform labor system generates a trap of deskilling and fragmentation. Piece-rate payment structures combined with highly sophisticated dispatch algorithms divide labor into extremely short, repetitive, and low-autonomy tasks. This labor organization not only prevents workers from accumulating professional skills but also fragments the labor process to such an extent that workers become increasingly isolated from one another. Such atomization weakens opportunities for interaction among workers, thereby undermining the formation of collective identity and reducing the likelihood of unionization or collective organization.

Third, platform governance mechanisms facilitate the transfer of risks to workers and contribute to the breach of psychological contracts. By labeling workers as "partners" rather than employees, platform companies are able to avoid employer responsibilities and shift risks—including occupational accidents, vehicle depreciation, and income instability—onto individual workers. When the algorithm-driven pursuit of efficiency conflicts with workers' initial expectations of "flexible work" and "higher earnings through greater effort," a significant discrepancy emerges between expectations and reality. This discrepancy may lead to deeper forms of social alienation and institutional distrust among workers.

In summary, algorithmic management within the platform economy restructures labor relations by combining technological surveillance, fragmented labor organization, and institutional risk transfer. Rather than enhancing worker autonomy, these mechanisms may ultimately reinforce new forms of labor control and insecurity within contemporary digital labor markets.

6. Discussion

Our findings illustrate the broader structural implications of algorithmic capitalism. First, algorithmic management contributes to the deskilling of labor, as delivery workers primarily follow navigation instructions and algorithmic commands rather than exercising independent decision-making. Their labor value becomes increasingly reduced to physical endurance. Second, the fragmentation of tasks allows platforms to avoid traditional labor regulations by redefining workers as independent contractors, thereby enabling a form of institutional arbitrage that shifts social protection responsibilities away from the platform. Finally, the discrepancy between the initial promise of flexibility and the actual working conditions contributes to psychological contract breach. As delivery workers experience declining pay and increasing control, feelings of distrust toward platforms, unions, and government institutions may intensify, potentially leading to broader forms of worker alienation and social disengagement.

7. Practical Implications

Based on the findings of this study, several practical recommendations are proposed to mitigate the potential negative impacts of algorithmic management on workers' rights and well-being.

First, platforms should develop a more context-sensitive dispatch mechanism that recognizes the human and situational realities of platform labor. One important measure is the introduction of a "rejection buffer" system, which revises the current logic in which task refusal is automatically penalized. Platform algorithms should allow workers to decline delivery requests under reasonable circumstances without categorizing such behavior as a negative performance indicator.

In addition, platforms should incorporate contextual parameters into algorithmic decision-making. For example, in service-oriented tasks such as care-related delivery or customer interaction, workers who spend additional time providing higher-quality service(such as offering assistance to elderly customers) should receive a form of quality-based performance credit, rather than being penalized for reduced delivery speed. Such adjustments would enable algorithmic systems to better account for qualitative aspects of labor that are currently overlooked by efficiency-oriented metrics.

Second, greater transparency in algorithmic management is necessary to reduce the uncertainty and perceived unfairness associated with "black-box" decision-making. Platforms should provide workers with a clear explanation of the key factors that influence order allocation, acceptance rates, and performance ratings. Granting workers a degree of algorithmic explanation rights can help alleviate anxiety and enhance trust in the platform governance system.

Furthermore, platforms should introduce human review mechanisms for major disciplinary decisions. In cases involving account suspension, deactivation, or other severe penalties, an independent human review process should be implemented to ensure that workers have the opportunity to explain exceptional circumstances. This human oversight can prevent purely automated decisions from producing unjust outcomes.

Finally, the study highlights the importance of strengthening collective protections and institutional arrangements for platform workers. Policymakers and labor organizations should encourage the development of digital labor unions or online worker associations, which would allow platform workers to participate in collective dialogue and negotiation regarding key algorithmic parameters, such as payment structures and mandatory rest periods.

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