



Algorithmic Control and Work Motivation in the Gig Economy: A Self-Determination Theory Approach among Chinese Food Delivery Platform Workers

Xiuzhi Li, Jirapong Ruanggoon*

Faculty of Management Science, Dhonburi Rajabhat University, Bangkok, Thailand

*Corresponding author (Jirapong Ruanggoon: jirapong.r@dru.ac.th)

Abstract: The research objectives were 1) to examine the effect of algorithmic control on the intrinsic and extrinsic work motivations of Chinese food delivery platform workers, and 2) to explore the mediating role of the need for autonomy, competence, and relatedness in the relationship between algorithmic control and work motivation among Chinese food delivery platform workers. This study employed quantitative research methods, collecting data from a sample of 547 valid food delivery platform employees in China. Data analysis included descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics (confirmatory factor analysis, correlation analysis, and structural equation modeling based on the Bootstrap method). The findings revealed that 1) algorithmic control had a significant negative direct impact on the intrinsic motivation of food delivery platform employees, but a significant positive direct impact on their extrinsic motivation, indicating an "intrinsic-extrinsic displacement" phenomenon, and 2) basic psychological needs played a complex mediating role: algorithmic control significantly inhibited intrinsic motivation by weakening the need for autonomy and relatedness, but simultaneously enhanced employees' sense of competence through clear task guidance and real-time feedback, thus supporting intrinsic motivation to some extent. Based on the findings of this study, to build a sustainable and human-centric gig economy ecosystem, the following three governance recommendations are proposed. First, reframe algorithmic design by integrating autonomy, competence, and relatedness into the core decision-making logic, transforming algorithms from "control tools" to "empowerment partners". Second, establish a hybrid governance system combining algorithms and human support through dedicated welfare officers and bidirectional negotiation mechanisms, addressing social isolation and psychological need deficits caused by algorithmic control. Third, implement a real-time monitoring and dynamic adjustment mechanism based on psychological needs, enabling platforms to shift from static monitoring to dynamic responsiveness and effectively preserve workers' intrinsic motivation.

Keywords: algorithmic control, basic psychological needs, work motivation, food delivery platform workers

1. Introduction

The development of digital technology has given rise to new forms of flexible employment. Online labor platforms use the Internet to connect laborers and employers, and use algorithmic technology and data information to achieve rapid and accurate matching of labor supply and demand [1]. De Stefano (2016) also found in his study of the gig market that technological changes have separated workers and organizations in space[2]. Online labor platforms use algorithmic technology to include the global labor force in their business operation model. Potential customers and workers establish connections autonomously through the platform, greatly improving the efficiency of employment. Wood et al. (2019) showed in their study of the global gig economy that despite differences in specific national backgrounds and types of work, different cases show that algorithmic control is the core of the operation of online labor platforms[3]. The platform uses algorithms to perform task allocation, path planning, performance control, dynamic pricing, incentives/punishments, and even job dismissals [4][5]. This algorithmic control has a complex and far-reaching impact on the work motivation and behavior of gig workers, which constitutes the core concern of this study. As a core factor affecting labor quality and sustainability, the work motivation of food delivery platform workers has a complex relationship with algorithmic control.

In recent years, domestic and foreign scholars have conducted many empirical studies on algorithmic control, focusing mainly on the following aspects:

- (1) On the reshaping of the labor process and labor relations by algorithmic control.

Research generally believes that algorithmic control has profoundly reshaped the labor process through "digital control". The platform uses data and software to replace the direct supervision of traditional managers and constructs a labor order that seems to be depersonalized but is more tightly controlled [6]. In this regard, Chinese scholars have proposed that under

algorithmic control, the traditional "labor relationship" identification faces difficulties, and the focus of legal regulation should shift from identity judgment to substantive protection of workers' "labor rights", regardless of whether they have a formal employment relationship [7].

(2) The impact of algorithmic control on the work autonomy of platform workers.

The impact of algorithmic control on workers' autonomy is complex and contradictory. Some scholars point out that algorithmic management provides platform gig workers with the opportunity to choose when and where to work, thereby improving their work autonomy. This increase in autonomy helps to enhance the intrinsic motivation of platform gig workers and thus improve their job satisfaction and performance[8][9]; However, some scholars believe that algorithmic management may weaken the autonomy of platform gig workers through invisible labor process control [10], leading to the emergence of the work autonomy paradox, that is, the gig platform strengthens the control of the labor process of platform gig workers through algorithmic technology, limiting their work autonomy [1][11].

(3) The impact of algorithmic control on the well-being and career development of platform workers.

Many studies have revealed the negative impact of algorithmic control on workers' well-being, including but not limited to overwork, unstable income, job burnout, social isolation, and suppressed innovative behavior [12][13][14]. Other studies have found that clear algorithmic rules reduce job uncertainty to a certain extent but may negatively predict the turnover tendency of online ride-hailing drivers [15].

In summary, domestic and foreign scholars have conducted a series of studies on the protection of gig workers' rights, negative/positive impacts, work pressure, and job satisfaction under algorithms, and have achieved phased results. However, current research still has certain limitations: First, existing studies mostly explore the negative or positive impact of algorithmic control on gig workers, lacking research on the "double-edged sword" effect; second, they mostly focus on the analysis of algorithmic control on the protection of platform gig workers' rights, sense of fairness, emotions, pressure, etc., and lack research on the impact of algorithmic control on platform gig workers' motivation and the mediating role of basic psychological needs.

Based on self-determination theory, the stimulation of work motivation depends on the satisfaction of three basic psychological needs: autonomy (the right to choose work independently), competence (affirmation of work ability), and relatedness (connection with the group) [16]. The "black box" dispatching of algorithms may weaken autonomy (such as forced acceptance of orders), dynamic reward and punishment mechanisms (such as overtime fines) may reduce competence, and "individualized" work models are prone to a lack of sense of relatedness [17]. The specific explanation is as follows: the platform usually does not fully disclose all the details of the task to the workers, such as the exact calculation method of compensation, the potential difficulty of the route, etc. This information restriction directly deprives workers of the right to make fully informed choices, thereby limiting their autonomy; punitive measures such as overtime fines are essentially negative feedback, which directly conveys the message to workers that "you are not competent for the job" or "you have failed". This feedback will directly damage the individual's perception of ability; algorithmic control also tends to personalize work, and when workers must compete with each other for high rankings (which affects their chances of obtaining future jobs and financial incentives), they are less likely to establish trusting and supportive relationships. This study focuses on China's food delivery platforms and, based on self-determination theory, deeply analyzes how algorithmic control shapes the work motivation of food delivery riders by affecting their basic psychological needs.

Conducted a questionnaire survey among Chinese food delivery platform workers. The study aimed to examine the impact of algorithmic control on their work motivation and explore the mediating role of basic psychological needs (autonomy, competence, and belonging) in the relationship between algorithmic control and their work motivation. This research enriches the theoretical boundaries and practical applications of self-determination theory. The insights provided can provide practical recommendations for optimizing algorithm design and management strategies for gig work platforms, such as food delivery platforms, thereby improving platform efficiency and worker job satisfaction.

2. Literature Review

2.1 Self-determination Theory and Work Motivation

In the 1980s, American psychologists Deci and Ryan et al. founded the self-determination theory [16]. The theory reveals that individuals can freely choose and determine their own behavior based on a full understanding of the current internal and external environment. At present, the self-determination theory has been widely used and verified in the field of organizational management, forming a basic theoretical model of "work environment-basic psychological needs-work motivation". The theory believes that autonomy, competence, and relatedness are the three basic psychological needs of individuals. The social environment can enhance the internal motivation of individuals, promote the internalization of

external motivation, and ensure the healthy development of individuals by meeting these three basic psychological needs [18]. The need for autonomy refers to the inherent need of individuals to have a sense of control in a certain behavior and activity and to make independent choices; the need for competence refers to the inherent need of individuals to feel proficient or competent in goals, skills or tasks in society; the need for relatedness refers to the desire to communicate with others and to feel the closeness, care and understanding of others [19].

Based on the different causes of motivation, the self-determination theory divides human motivation into two types, namely intrinsic motivation and extrinsic motivation. Among them, intrinsic motivation refers to the behavior driving mechanism that exists naturally in the individual, while extrinsic motivation refers to the expectation of something based on the external environment, and the hope to engage in a certain behavior or achieve a certain result through one's own efforts. Specifically speaking, in combination with food delivery riders:

Intrinsic motivation: The driving force behind delivery riders' works due to the interest, pleasure or satisfaction that the work itself brings.

Extrinsic motivation: The driving force behind delivery riders' work to obtain external results (e.g., compensation, avoiding punishment, social recognition).

Compared with extrinsic motivation, intrinsic motivation is more conducive to individuals' full commitment to work and can more effectively motivate platform gig workers to continue to choose to stay on the gig platform and be enthusiastic about gig work, which to a certain extent provides guarantees for the sustainable development of gig platform companies. The motivational effect of intrinsic motivation depends on the degree to which the external work environment satisfies the basic psychological needs of individuals, among which the basic psychological needs are composed of autonomy needs, competence needs and relationship needs [20].

2.2 Hypothesis Development

In the process of algorithm control, to improve service quality and efficiency, the platform can use GPS, motion status and other data information to automatically constrain the behavior of platform workers [21]. The compression of the autonomy of riders by the algorithm of the food delivery platform is reflected in many aspects: first, time control. The algorithm simplifies the real scene into the "delivery time" indicator, and the rider's action rhythm is kidnapped by the time frame. The algorithm will constantly test the rider's speed limit, shorten the delivery time and force acceleration.

Overtime will face fines, demotion and other penalties. Riders almost lose the space to arrange their own rhythm and even have to sacrifice their rest time. Secondly, the path and behavior are strongly constrained. The algorithm plans the "optimal route" and forces navigation through the App. Riders who deviate may be judged as "illegal" [22]. At the same time, the process of taking photos to confirm the meal and delivering it, and the telephone communication process are monitored by the system, and the space for independent judgment and flexible processing is greatly compressed. Finally, the labor autonomy is weakened. The algorithm allocates orders, which limits the rider's choice. New riders or those with low scores often passively accept bad orders. Rejection of orders is limited by the "rejection rate" [22]. A high rejection rate may lead to account restrictions and weakened autonomy. Therefore, this study proposes the following hypotheses:

H1a: Algorithmic control has a significant negative effect on the need for autonomy;

H1b: The need for autonomy has a significant positive impact on intrinsic motivation;

H1c: The need for autonomy mediates the relationship between algorithmic control and the intrinsic motivation of platform gig workers.

The algorithm significantly simplifies the operation complexity of riders through intelligent dispatching (e.g., automatically assigning orders instead of manually grabbing orders) and real-time route planning (dynamic navigation based on GPS traffic conditions). This "deskilling" design allows gig workers to quickly adapt to work without relying on experience accumulation. Especially for novice riders, the standardized instructions provided by the algorithm greatly reduce the difficulty of business development. Pei et al. (2021) pointed out that the algorithm provides riders with a clear work framework through the "standard guidance" dimension and the "tracking and evaluation" dimension, making it easier for them to master the logic of task execution[24]. Technical assistance reduces work obstacles. The intelligent navigation system can avoid congested routes and avoid situations where riders are unfamiliar with the route, shortening delivery time. The algorithm gives riders instant recognition through real-time evaluation (such as punctuality, customer ratings, and reward prompts) [25]. Riders will feel that their abilities are verified by the system, thereby strengthening their sense of self-efficacy of "I can do it." This technological empowerment enables riders to cope with dynamic environments "handier" and strengthen their perception of the controllability of their work [26]. Therefore, this study proposes the following hypotheses:

H2a: Algorithmic control has a significant positive impact on competence needs;

H2b: The need for competence has a significant positive impact on intrinsic motivation;

H2c: The need for competence mediates the relationship between algorithmic control and the intrinsic motivation of platform gig workers.

By transferring labor supervision rights to consumers (such as ratings and complaint mechanisms), the algorithm makes riders a "buffer layer" for conflicts between platforms and users. Consumers directly determine the income of riders through the "absolute evaluation rights" granted by the algorithm (such as bad reviews and complaints), causing riders to fall into a state of "emotional labor overload": they need to undertake additional emotional work such as appeasing users and explaining delays, but they are isolated due to lack of organizational support [23]. At the same time, the algorithm's strict requirements on timeliness compress riders' social time, weaken their family connections and social needs, and further reduce their sense of social relatedness. Therefore, this study proposes the following hypotheses:

H3a: Algorithmic control has a significant negative impact on the need for relatedness;

H3b: The need for relatedness has a significant positive impact on intrinsic motivation;

H3c: The need for relatedness mediates the relationship between algorithmic control and the intrinsic motivation of platform gig workers.

The algorithmic control of food delivery platforms has a complex and direct impact on the intrinsic and extrinsic motivations of workers [27]. Algorithmic control often compresses the workers' autonomous decision-making space through strict task allocation and time limits, reduces their sense of control over their work, and thus weakens intrinsic motivation [28]. For example: the algorithm forcibly plans the delivery route, and it is difficult for riders to flexibly adjust according to their own experience, which reduces the fun and sense of accomplishment in the work [29]. In terms of extrinsic motivation, the performance standards and reward and punishment mechanisms set by the algorithm, such as rewards for completing a certain number of orders and fines for overtime, are directly linked to income, which significantly stimulates the extrinsic motivation of workers to work for rewards. Therefore, this study proposes the following hypotheses:

H4: Algorithmic control has a significant negative impact on intrinsic work motivation.

H5: Algorithmic control has a significant positive impact on extrinsic work motivation.

2.3 Conceptual Framework

The conceptual framework of this study is shown in Figure 1:

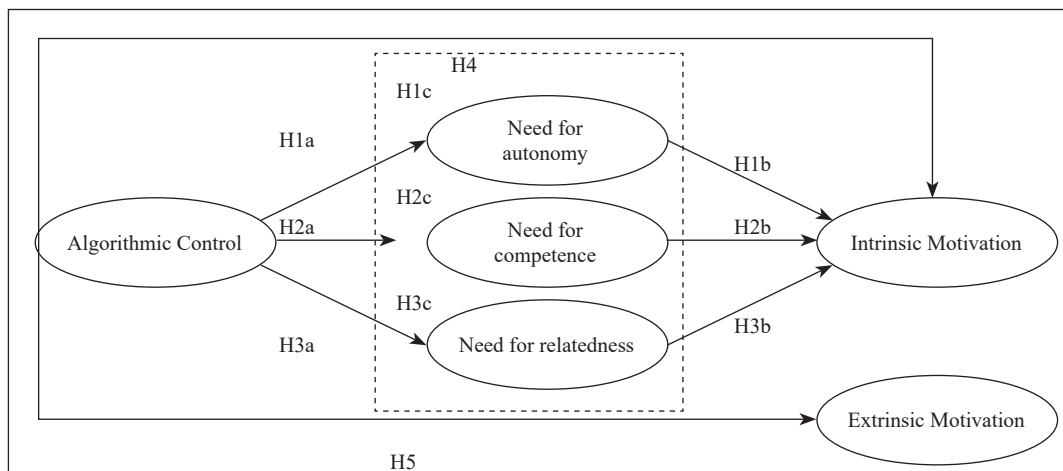


Figure 1. Conceptual framework

With Self-Determination Theory (SDT) as the core theoretical cornerstone, this paper aims to systematically reveal how algorithmic control affects the basic psychological needs of food delivery workers in the context of the gig economy and then affects their work motivation (including intrinsic motivation and extrinsic motivation). This framework constructs a parallel mediation model to explore the mechanism by which algorithms affect employees' psychology and behavior.

3. Research Methods

3.1 Design

This study aimed to explore the impact of algorithmic control on the work motivation of food delivery platform workers in the context of the gig economy, and to examine the mediating role of the three basic psychological needs (autonomy, competence, and relatedness) in the self-determination theory. To achieve this research goal, a quantitative research method

was adopted.

A cross-sectional quantitative research design was employed. This design allowed for the collection of a large amount of data at a specific time point to test the relationships between variables and the hypothesized model [30], and was suitable for exploring the complex relationship between algorithmic control, psychological need satisfaction, and work motivation [31][32].

The data for this study were collected through an online questionnaire survey. To ensure the reliability and validity of the research, the design and implementation of the questionnaire followed steps such as drawing on mature scales and preliminary design, expert consultation and questionnaire revision, pre-survey, and reliability and validity testing.

3.2 Sample

Considering that this study used structural equation modeling for data analysis, there were certain requirements for the sample size. According to the recommendations of authoritative guidelines in this field, the sample size for the structural equation model should be at least 5 to 10 times the number of measurement items to ensure the stability of model estimation and the reliability of results [33]. The total number of items in this study's scale was about 34 (11 items on algorithm control, 16 items on basic psychological needs, and 7 items on work motivation). A total of 600 questionnaires were distributed, and 547 valid questionnaires were actually collected, resulting in an overall response rate of 91.17%. Among these 547 completed questionnaires, the respondents' gender, age, marital status, educational background, household registration status, and basic job characteristics are presented in Table 1.

Table 1. Basic Information of the Sample

Basic Information	Option	Frequency	Percentage (%)
Sex	Male	406	74.2
	Female	141	25.8
Age	Under 20 years old	24	4.4
	20-29 years old	234	42.8
	30-39 years old	219	40
	40-49 years old	63	11.5
	50 years old Above	7	1.3
	Junior high school	97	17.7
Educational background	Senior high school	276	50.5
	Undergraduate or junior college	163	29.8
	Master's degree and above	11	2
Marital status	Married	187	34.2
	Single	360	65.8
Job type	Part-time	157	28.7
	Full-time	390	71.3
Amount to		547	100

3.3 Research Instruments

This study used a structured electronic questionnaire, which was distributed and collected through online questionnaire platforms (such as Wenjuxing and Tencent Questionnaire). The questionnaire consisted of two parts: basic personal information and core variable measurement scales. All measurement scales used the Likert 5-point scoring method (1 = very inconsistent, 5 = very consistent).

The measurement tools selected in this study were all from relatively mature scales at home and abroad, and the English scales were strictly processed according to the "translation-back translation" procedure. The scales are introduced as follows:

3.3.1 Algorithm Control

The 11-item scale developed by Pei Jialiang et al. [24] was selected for measurement. It consisted of 11 items. Typical question types included: The algorithm intelligently assigns my work tasks; The algorithm tracks and locates my geographical position in real-time; When my work fails to meet the platform's requirements, the algorithm will penalize me.

3.3.2 Basic Psychological Needs

The W-BNS scale developed by Van den Broeck et al. [34] was used for measurement, which included three dimensions: autonomy needs, competence needs, and relatedness needs, and consisted of 16 items. Typical questions included: I feel like

I can be myself at my job; I really master my tasks at my job; At work, I feel part of a group.

3.3.3 Work Motivation

The work motivation scale developed by Gagné et al. [35] was selected for measurement. A 3-item intrinsic motivation scale and a 4-item extrinsic motivation scale were used, with typical question types such as: Because I have fun doing my job; Because only when I put enough effort in my work will the platform give me financial rewards.

3.3.4 Control Variables

Demographic information: basic background information of the respondents was collected, including: gender, age, education level, years of working in food delivery, and average daily working hours. These variables were set as control variables to eliminate interference. Gender was coded as: male = 1, female = 2; age was coded as: less than 20 years old was coded as 1, 20-29 years old was coded as 2, 30-39 years old was coded as 3, 40-49 years old was coded as 4; 50 years old and above was coded as 5; education level was coded as: junior high school is 1, high school is 2, undergraduate or junior college is 3, and master's degree and above is 4.

3.4 Data Analysis

This study used data collection software and data processing and analysis software for data collection and analysis, integrating methods such as common method bias testing, descriptive statistics, reliability and validity testing, correlation analysis, and hypothesis testing.

Harman's single-factor test was applied for post-hoc diagnosis of common method bias. Descriptive statistics were utilized to summarize the demographic characteristics of the sample and to understand the data distribution. For reliability testing, Cronbach's Alpha coefficient was used to assess the internal consistency of the scales, while validity testing was conducted using software for confirmatory factor analysis, with model fit evaluated through indicators such as CMIN/DF, CFI, TLI, and RMSEA. Correlation analysis explored the associations between variables via Pearson's correlation coefficients. In the hypothesis testing stage, a structural equation model was constructed, and the Bootstrap method was combined to test the significance of the mediating and direct effects, thereby providing empirical support for the research hypotheses.

4. Findings

Given that the results of this study were all derived from the same participants' self-reports, there was a potential for common method bias. To examine this issue, Harman's single-factor test was conducted. The test extracted six factors from all items, which collectively explained 65.622% of the variance. The first principal component accounted for 21.558% of the variance, which did not exceed the critical threshold of 40% [36]. This indicated that there was no significant issue of common method bias, and the data were suitable for further analysis.

4.1 Reliability Analysis

Table 2. Cronbach's Reliability Analysis

Measurement code	Correction term total correlation (CITC)	Deleted alpha coefficients for item	Cronbach's alpha coefficient
AC1	0.814	0.926	0.936
AC2	0.695	0.931	
AC3	0.719	0.93	
AC4	0.697	0.931	
AC5	0.725	0.93	
AC6	0.713	0.931	
AC7	0.698	0.931	
AC8	0.734	0.93	
AC9	0.699	0.931	
AC10	0.725	0.93	
AC11	0.8	0.927	0.889
NA1	0.78	0.857	
NA2	0.68	0.873	
NA3	0.663	0.876	
NA4	0.671	0.875	
NA5	0.683	0.873	
NA6	0.759	0.86	

Measurement code	Correction term total correlation (CITC)	Deleted alpha coefficients for item	Cronbach's alpha coefficient
NC1	0.756	0.792	0.856
NC2	0.671	0.828	
NC3	0.659	0.835	
NC4	0.729	0.804	
NR1	0.766	0.846	
NR2	0.659	0.864	
NR3	0.652	0.865	0.88
NR4	0.674	0.862	
NR5	0.638	0.867	
NR6	0.749	0.849	0.831
IM1	0.733	0.724	
IM2	0.66	0.802	
IM3	0.694	0.763	0.856
EM1	0.76	0.791	
EM2	0.68	0.826	
EM3	0.665	0.832	
EM4	0.709	0.814	

As shown in Table 2, the Cronbach's α coefficients for the six dimensions designed in this study are 0.936, 0.889, 0.856, 0.880, 0.831, and 0.856, all greater than 0.8, indicating good internal consistency across the questionnaire dimensions. Therefore, the results of this survey have good reliability and are highly dependable, allowing for further analysis.

4.2 Validity Analysis

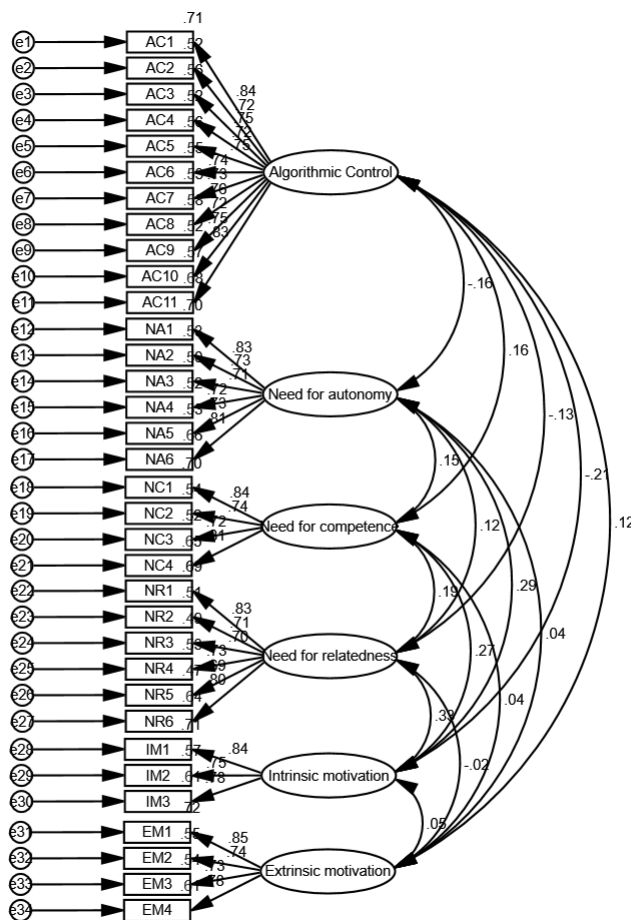


Figure 2. Confirmatory Factor Analysis (CFA) of the Measurement Model

Table 3. Measurement Model Fit Index

CMIN/df	GFI	CFI	TLI	IFI	RMSEA
1.051	0.946	0.997	0.997	0.997	0.01
<5	>0.9	>0.9	>0.9	>0.9	<0.08

According to the fit index results in Figure 2 and Table 3, CMIN/df is 1.051, which is less than the critical criterion of 5; RMSBA is 0.01, far below the recommended value of 0.08; meanwhile, the incremental fit indices such as GFI, CFI, TLI, and IFI are all above 0.9. This indicates that the six-factor measurement model proposed in this study has excellent fit with the observed data, laying a solid foundation for subsequent validity analysis.

Table 4. Convergence Validity Scale

Latent variable	Manifest variable	Nonstandard load factor	Standard load coefficient	SE	z	p	AVE	CR
Algorithmic control	AC1	1.000	0.843	-	-	-	0.572	0.936
	AC10	0.749	0.753	0.036	20.729	***		
	AC11	0.949	0.825	0.040	23.902	***		
	AC2	0.686	0.722	0.035	19.523	***		
	AC3	0.735	0.745	0.036	20.435	***		
	AC4	0.676	0.721	0.035	19.480	***		
	AC5	0.771	0.751	0.037	20.674	***		
	AC6	0.712	0.740	0.035	20.243	***		
	AC7	0.693	0.725	0.035	19.645	***		
	AC8	0.759	0.762	0.036	21.120	***		
Need for autonomy	NA1	1.000	0.834	-	-	-	0.574	0.890
	NA2	0.737	0.730	0.039	18,738	***		
	NA3	0.702	0.710	0.039	18,071	***		
	NA4	0.696	0.718	0.038	18,359	***		
	NA5	0.715	0.731	0.038	18,799	***		
	NA6	0.934	0.814	0.043	21.699	***		
Need for competence	NC1	1.000	0.839	-	-	-	0.604	0.859
	NC2	0.732	0.736	0.040	18.142	***		
	NC3	0.675	0.722	0.038	17.704	***		
	NC4	0.939	0.806	0.047	20.072	***		
Need for relatedness	NR1	1.000	0.828	-	-	-	0.554	0.881
	NR2	0.706	0.714	0.039	17.926	***		
	NR3	0.710	0.699	0.041	17.442	***		
	NR4	0.710	0.726	0.039	18.308	***		
	NR5	0.660	0.685	0.039	17.019	***		
	NR6	0.959	0.803	0.046	20.875	***		
Intrinsic motivation	IM1	1.000	0.841	-	-	-	0.629	0.835
	IM2	0.733	0.753	0.042	17.420	***		
	IM3	0.895	0.782	0.050	17.931	***		
Extrinsic motivation	EM1	1.000	0.848	-	-	-	0.604	0.859
	EM2	0.728	0.742	0.040	18.290	***		
	EM3	0.716	0.733	0.040	18.032	***		
	EM4	0.904	0.781	0.047	19.398	***		

Note: A hyphen '-' indicates that the item is a reference item.

All measurement items under each latent variable have significant standard loadings, and the standardized factor loadings are all higher than the recommended standard of 0.6, indicating that each item is well representative in its respective dimension and has strong convergent validity.

Table 4, from the perspective of convergent validity, the mean variance extracted (AVE) of each surface is greater than 0.5, which meets the judgment criteria proposed by Fornell and Larcker (1981)[37], indicating that each latent variable has strong convergent validity. The composite reliability (CR) values of all variables also exceed the critical standard of 0.7, showing that the measurement of each latent variable has good internal consistency and meets the judgment requirements of surface reliability.

Table 5. Discriminant Validity: Pearson Correlation and AVE Square Root Value

	Algorithmic control	Need for autonomy	Need for competence	Need for relatedness	Internal motivation	External motivation
Algorithmic control	0.756					
Need for autonomy	-0.155**	0.758				
Need for competence	0.163***	0.155**	0.777			
Need for relatedness	-0.126**	0.122*	0.188***	0.744		
Internal motivation	-0.213***	0.293***	0.271***	0.335***	0.793	
External motivation	0.12*	0.037	0.038	-0.016	0.048	0.777

Note: The bolded values on the diagonal are the square roots of AVE, and the remaining values are the correlation coefficients between latent variables. * represents $P < 0.05$, ** represents $P < 0.01$, and *** represents $P < 0.001$.

This study adopted the criteria proposed by Fornell and Larcker (1981), which compares the square root of the AVE (average root of AVE) of each latent variable with its correlation coefficients with other latent variables[37]. If the square root of the AVE is greater than the correlation coefficients between latent variables, the scale is considered to have good discriminant validity. As can be seen from Table 5, the square root of the AVE for all latent variables is greater than its correlation coefficients with other variables, indicating that the scale dimensions have good discriminative power and can effectively distinguish different variables.

In summary, through systematic testing including reliability analysis and confirmatory factor analysis (CFA), the results indicate that the scales used in this study exhibit good internal consistency reliability, convergent validity, and discriminant validity.

4.3 Structural Equation Model Fitting and Path Analysis

The results of the Structural Equation Model (SEM) fitting and path analysis are presented in Figure 3 and Table 6.

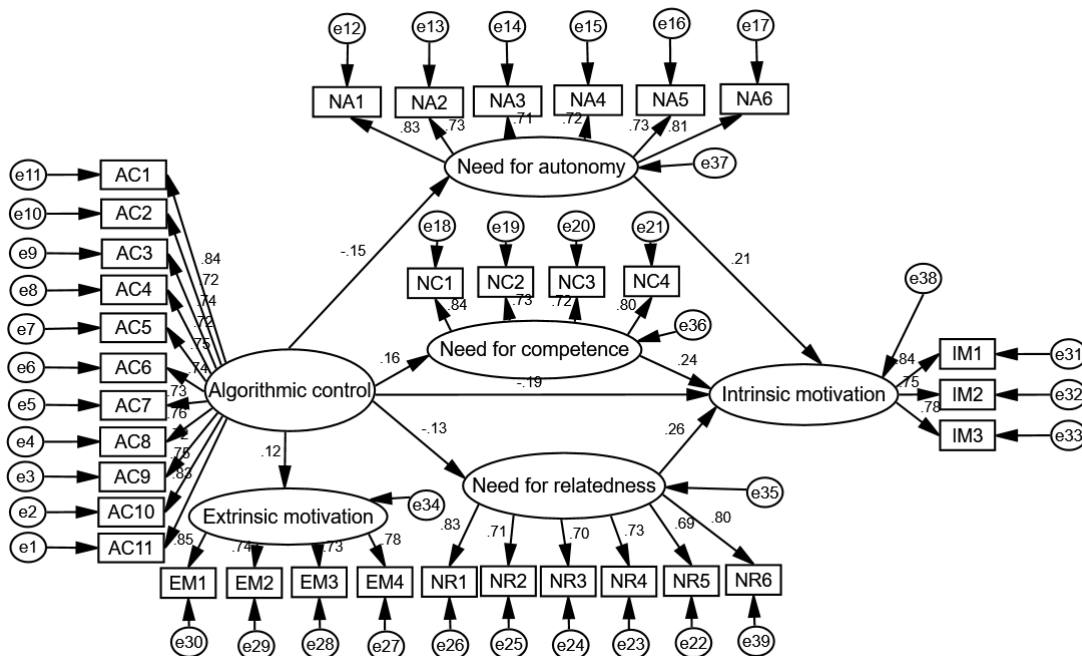


Figure 3. Structural Equation Model Diagram

Table 6. Structural Equation Model Fit Indices

CMIN/df	GFI	CFI	TLI	IFI	RMSEA
1.112	0.942	0.994	0.993	0.994	0.014
<5	>0.9	>0.9	>0.9	>0.9	<0.08

In summary, all core fit metrics are better than the recommended criteria, indicating that the structural equation model constructed in this study performs well in terms of overall fit, and the model structure has high rationality and explanatory power, providing a solid foundation for further exploration of causal path relationships between variables.

Table 7. Results of the Path Coefficient and Direct Effect Test

Path	Non-standard coefficients	Standard coefficient	SE	CR	P	Result		
AC	→	NA	-0.149	-0.154	0.045	-3.312	***	H1a supported
NA	→	IM	0.211	0.210	0.047	4.498	***	H1b supported
AC	→	NC	0.161	0.159	0.048	3.366	***	H2a supported
NC	→	IM	0.227	0.237	0.046	4.947	***	H2b supported
AC	→	NR	-0.119	-0.125	0.044	-2.675	0.007	H3a supported
NR	→	IM	0.262	0.257	0.048	5.452	***	H3b supported
AC	→	IM	-0.185	-0.190	0.045	-4.08	***	H4 supported
AC	→	EM	0.117	0.119	0.047	2.514	0.012	H5 supported

Note: AC stands for Algorithmic control, NA for Need for autonomy, NC for Need for competence, NR for Need for relatedness, IM for Internal motivation, EM for External motivation, and *** indicates $p < 0.001$.

This study used structural equation modeling (SEM) to conduct a path analysis on the relationship between algorithmic control and gig work motivation. The results are shown in Table 7.

(1) Regarding the need for autonomy (H1a, H1b): The results show that algorithmic control has a significant negative impact on the need for autonomy ($\beta = -0.154$, $p < 0.001$), while the need for autonomy has a significant positive impact on intrinsic motivation ($\beta = 0.210$, $p < 0.001$). Therefore, hypotheses H1a and H1b are supported.

(2) Regarding competency requirements (H2a, H2b): Algorithmic control has a significant positive impact on competency requirements ($\beta = 0.159$, $p < 0.001$), and competency requirements can significantly and positively drive intrinsic motivation ($\beta = 0.237$, $p < 0.001$). Therefore, hypotheses H2a and H2b are supported.

(3) Regarding the need for belonging (H3a, H3b): Algorithmic control has a significant negative predictive effect on the need for belonging ($\beta = -0.125$, $p = 0.007$), while the need for belonging has a significant positive effect on intrinsic motivation ($\beta = 0.257$, $p < 0.001$). Therefore, hypotheses H3a and H3b are supported.

(4) Regarding direct motivation (H4, H5): Algorithmic control has a significant negative direct impact on the intrinsic motivation of gig workers ($\beta = -0.190$, $p < 0.001$) and a significant positive direct impact on their actual extrinsic motivation ($\beta = 0.119$, $p = 0.012$). Therefore, hypotheses H4 and H5 are supported.

4.4 Mediation Effect Test

The mediating role of basic psychological needs was examined using the Bootstrap self-sampling method (5000 repeated samplings), and the results are shown in Table 8.

Table 8. Bootstrap Test Results of the Mediation Effect

Path	Estimate	Lower	Upper	P	Result
AC→NA→IM	-0.032	-0.062	-0.013	0.001	H1c supported
AC→NC→IM	0.038	0.014	0.072	0.001	H2c supported
AC→NR→IM	-0.032	-0.063	-0.009	0.006	H3c supported

(1) The mediating role of need for autonomy (H1c): The indirect effect of the path "Algorithmic control → Need for autonomy → Internal motivation" is -0.032, with a 95% bias-corrected confidence interval of [-0.062, -0.013], excluding 0 ($p = 0.001$). This indicates that algorithmic control inhibits intrinsic motivation by weakening workers' sense of autonomy, thus supporting hypothesis H1c.

(2) Mediating effect of need for competence (H2c): The indirect effect value of the path "Algorithmic control → Need

for competence → Internal motivation" is 0.038, with a 95% bias-corrected confidence interval of [0.014, -0.072], excluding 0 ($p=0.001$). This indicates that algorithmic control enhances workers' sense of competence by providing clear task guidance, thereby exerting a certain compensatory positive influence on intrinsic motivation, thus supporting the hypothesis H2c.

(3) Mediating effect of need for relatedness (H3c): The indirect effect of the path "Algorithmic control → Need for relatedness → Internal motivation" is -0.032, with a 95% bias-corrected confidence interval of [-0.063, -0.009], excluding 0 ($p=0.006$). This indicates that mechanized interactions under algorithmic control reduce a sense of belonging, thereby significantly inhibiting intrinsic motivation, thus supporting hypothesis H3c.

5. Discussion

This study extends the application context of Self-Determination Theory (SDT) from traditional offline organizational management to the online algorithmic management of the gig economy, systematically revealing how algorithmic control—as a novel external environment—shapes workers' motivation by differentially influencing their three basic psychological needs. It confirms that in the gig economy context, the three basic needs for autonomy, competence, and relatedness remain key bridges connecting the external algorithmic control environment to individuals' internal motivational states. This validates the "work environment → basic psychological needs → work motivation" theoretical model within digital labor contexts, thereby extending the boundaries of SDT.

This study finds that algorithmic control can be conceptualized as a form of "quasi-management control": while functionally simulating or even surpassing core functions of traditional management, it differs essentially in form. Algorithmic systems systematically perform the complete managerial functions of planning, organizing, directing, coordinating, and controlling [38]. They allocate resources by predicting demand and routing [39][40], precisely direct workers through automatic order dispatching and real-time navigation, and enforce strict control and evaluation via performance metrics, process monitoring, and automated rewards and penalties [41][11]. Algorithms effectively substitute for managers' roles in traditional bureaucracies, taking on core responsibilities such as task assignment, progress supervision, and performance appraisal. The fundamental difference between algorithmic control and traditional management lies in its "a typical form": traditional management relies on organizational hierarchy, rules, and human judgment, whereas algorithmic control relies on data authority, code-based rules, and computational power. Its controlling agent is "non-human," lacking human discretion [42]. By tracking and quantifying the entire labor process in real time via data [43], finely constraining behavior through dynamic reward-penalty systems [41], and implementing depersonalized, all-pervasive surveillance, algorithmic control constructs a more penetrating system of control than traditional management.

The findings reveal a dual-edged effect of this "quasi-management control," reflected in its differential impact on the three basic psychological needs. First, algorithmic control significantly negatively affects autonomy, contrasting with views suggesting that algorithm management on delivery platforms enhances riders' work autonomy. Some studies have argued that algorithmic management offers gig workers autonomy over when and where to work, potentially increasing perceived autonomy [44][45][3][46]. However, this study supports an alternative view: algorithmic management erodes platform workers' autonomy through invisible control over the labor process [47][48][49], resulting in a "paradox of work autonomy." To resolve this contradiction, the study distinguishes between "entry autonomy" and "process autonomy." Many riders join platforms with initial expectations of "being their own boss" or seeking greater flexibility. Yet once they click "go online" to accept orders, they enter a system under stringent algorithmic control at the micro-operational level, where every task and step is closely monitored and directed [43]. After encountering such tight control, this expectation gap may amplify their sense of autonomy deprivation. The paradox of "superficial autonomy but actual control" is central to riders' daily experience.

Furthermore, the sample shows that 68.2% of workers had a high school education or less, and 71.3% were full-time workers, indicating most riders have relatively low educational attainment. Amid global (including China's) economic downturn, they face limited career alternatives and rely primarily or entirely on platform income for survival. This high economic dependence under survival pressure makes riders highly sensitive to extrinsic motivation (earning income, avoiding fines), amplifying the effectiveness of algorithmic control—which directly reinforces extrinsic motivation through reward-penalty systems. When riders perceive they "must work" without freedom to exit, the lack of autonomy becomes more salient and distressing, likely strengthening the association between algorithmic control and impaired autonomy needs. Therefore, evaluating autonomy requires situating it within the concrete labor process, rather than simplistically equating it with schedule flexibility.

In Chinese culture, where people hold deeper expectations for collective belonging and interpersonal connection [50], the atomized, competitive work mode under algorithmic control more sharply undermines gig workers' sense of relatedness.

This study also confirms that algorithmic control significantly negatively affects relatedness, thereby weakening intrinsic motivation—robustly echoing and deepening discussions on platform labor causing social isolation.

Conversely, algorithmic control positively affects perceived competence, differing from views framing algorithms as “deskilling” tools (e.g., Rosenblat, 2018)[48]. Through smart navigation and performance feedback systems, algorithms reduce initial task difficulty, especially helping novices adapt quickly, while providing immediate efficacy feedback. This supports perspectives emphasizing the “enabling” side of technology—that technical assistance can reduce work obstacles and enhance perceived competence[51][52].

Under intense market competition, China’s major food delivery platforms have developed highly efficiency-oriented algorithmic systems. Mandatory order assignments, tight delivery windows, and fine-grained rewards and penalties tightly linked to earnings constitute “rigid constraints” far exceeding those of similar platforms in many other countries.

6. Conclusion

The results indicate that algorithmic control has a significant and direct negative impact on practitioners' intrinsic motivation. This means that as practitioners perceive the intensity of algorithmic control to increase, the motivation and satisfaction they derive from the work itself (such as the enjoyment of the delivery process and the sense of accomplishment from completing tasks) decreases significantly.

Conversely, algorithmic control exhibits a significant and direct positive impact on practitioners' extrinsic motivation. This suggests that the precise and immediate reward and punishment system constructed by algorithms (such as peak rewards, overtime penalties, and revenue linked to positive reviews) greatly strengthens practitioners' drive to work to obtain external rewards or avoid punishment.

Algorithm control significantly diminishes practitioners' need for autonomy ($\beta=-0.154$, $p<0.001$). The highly directive and standardized nature of algorithms in task allocation, path planning, work rhythm, and even behavioral norms severely compresses the space for practitioners to make autonomous decisions during the work process, leading to an increased sense of being controlled and a decreased sense of self-determination.

Algorithmic control significantly weakens practitioners' need for relevance ($\beta=-0.125$, $p=0.007$). Work is highly atomized, and interactions between practitioners and platforms, colleagues, and even merchants and consumers are mediated by algorithms. Interpersonal communication is simplified into standardized digital interactions, leading to increased feelings of social isolation and emotional alienation.

A noteworthy finding is that algorithmic control had a significant positive impact on workers' competence needs ($\beta=0.159$, $p<0.001$). By providing clear task guidance, real-time performance feedback, optimized route navigation, and quantifiable achievement systems (such as on-time delivery rate and positive review rate), the algorithm enabled workers to complete tasks more efficiently, thereby perceiving an improvement in their abilities and a sense of control over their work environment, thus satisfying their psychological need for job competence. Simultaneously, the needs for autonomy, competence, and relatedness all had a significant positive impact on intrinsic motivation. That is, when the three basic psychological needs of food delivery platform workers are met, their intrinsic motivation also increases.

This study, through a Bootstrap mediation test (Table 7), found that the three basic psychological needs of autonomy, competence, and connection play a mediating role in the relationship between algorithmic control and intrinsic motivation. Specifically, algorithmic control inhibits intrinsic motivation by weakening autonomy, inhibits intrinsic motivation by weakening connection, and promotes intrinsic motivation by enhancing competence.

Based on the findings of this study, the following three governance recommendations are proposed to foster a sustainable and human-centric gig economy ecosystem.

7. Recommendation

7.1 Construct a Human-Centered Algorithm Redesign Framework

Current algorithm design prioritizes efficiency maximization, which is the root cause of impaired psychological needs. It is recommended to fundamentally restructure the design philosophy and evaluation metrics of algorithms, incorporating worker well-being into the platform’s core decision-making logic to achieve a shift from “control tool” to “empowering partner.”

Design Philosophy Innovation: From “efficiency-first” to “needs balancing.” Translate the three basic psychological needs from Self-Determination Theory (SDT) into algorithmically recognizable and optimizable design parameters. Optimization objectives should not be limited to minimizing delivery time and cost; instead, a comprehensive utility function incorporating a “Needs Satisfaction Index” should be constructed. This index integrates dynamic indicators for autonomy,

competence, and relatedness, specifically manifested in:

Autonomy dimension: Introduce “flexibility weights” into order dispatch logic. The system should not only calculate optimal routes but also dynamically adjust dispatch intensity based on riders’ consecutive working hours. Embed response mechanisms in the algorithm that address riders’ “psychological need to feel their actions stem from personal volition and to make choices and decisions according to their own will,” such as establishing “autonomous rest windows” or “preferred route order” options to compensate for constrained autonomy.

Competence dimension: Algorithms should go beyond single-dimensional performance rankings to provide visualized “skill growth maps.” By analyzing data on riders’ handling of complex road conditions or emergencies, offer positive skill feedback to enhance their “sense of capability and efficacy in proficiently completing delivery tasks, effectively coping with various contingencies (e.g., adverse weather, complex routes), and meeting platform performance requirements”—transforming algorithms from mere monitors into enablers of competence.

Relatedness dimension: Incorporate “social capital” parameters into task matching and evaluation mechanisms. For instance, algorithms can prioritize matching riders with familiar merchants or encourage mutual aid among riders, thereby fostering riders’ “desire to establish emotional connections with others, feel cared for, and belong to a group,” mitigating the social isolation induced by algorithmic control.

7.2 Implement an “Algorithm–Interpersonal Hybrid Governance System”

This study finds that algorithmic control suppresses intrinsic motivation by undermining autonomy and relatedness, while mechanistic interactions under algorithmic control reduce belongingness. Future governance should not rely on technology replacing human interaction but construct a deeply coupled hybrid system integrating technical assistance and interpersonal support.

Establish “Algorithm Correction and Humanistic Support Specialist” positions: Introduce frontline “Rider Well-being Officers” in platform operations. Their responsibilities include handling complexities, ambiguities, and emotional issues beyond algorithmic capacity—for example, conducting manual reviews and providing emotional support when riders face algorithmic misjudgments or malicious customer complaints. This directly addresses the pain point of lacking relatedness, offering atomized workers accessible organizational support and interpersonal connection.

Build a “human–machine collaborative” dynamic negotiation mechanism: Break the unidirectional nature of algorithmic commands by establishing bidirectional feedback channels. At the team level, pilot “Algorithm Optimization Committees” comprising rider representatives, algorithm engineers, and operations managers to regularly deliberate on dispatch mechanisms and assessment criteria. At the individual level, grant riders limited “veto power” over algorithmic decisions, making the algorithmic system a negotiable and corrigible “quasi-partner,” thereby significantly enhancing riders’ psychological autonomy and relatedness while maintaining efficiency.

7.3 Establish Real-Time Monitoring and Adjustment Mechanisms Based on Psychological Needs

This study reveals that algorithmic control negatively affects intrinsic motivation through autonomy and relatedness, while positively influencing it through competence. This indicates platforms should not focus solely on efficiency metrics but develop a regulation system capable of real-time perception and response to riders’ psychological states.

Develop “rider psychological state sensing indicators”: Traditional algorithmic management monitors only hard metrics like delivery time and positive rating rates. It is recommended that platforms introduce soft indicators reflecting psychological needs—for example, monitoring order rejection rates (indicating impeded autonomy), frequency of route deviations (reflecting alignment between competence and algorithmic guidance), and mutual aid behavior data (reflecting relatedness status)—to construct a real-time psychological state dashboard. Since the motivational effect of intrinsic motivation depends on the extent to which external work environments satisfy individuals’ basic psychological needs, these indicators help platforms identify potential psychological risks early, rather than intervening only after turnover or conflict occurs.

Implement dynamic adjustment of algorithmic rules: When sensing systems detect abnormal fluctuations in psychological need indicators for specific regions or individuals, algorithms should dynamically adjust rules rather than remaining rigid. Examples include:

For autonomy frustration: If rising rejection rates subject riders to penalty risks (often signaling impaired autonomy), algorithms can automatically switch to a “gentle mode,” reducing mandatory dispatch ratios and granting greater choice.

For relatedness deficiency: If prolonged isolated work is detected, adjust incentive mechanisms to promote team-based tasks or regional gathering rewards, facilitating interaction among riders to alleviate social isolation and lack of belonging caused by algorithms.

Through this shift from “static monitoring” to “dynamic responsiveness,” platforms can promptly repair psychological

needs damaged by excessive pursuit of efficiency, sustaining workers' intrinsic work motivation.

8. Limitation and Future Research Suggestions

There are various limitations associated with this study. For instance, the use of a cross-sectional research design hinders the ability to establish causality between algorithmic control, psychological needs, and motivation at work. Furthermore, the sole use of self-reporting data collected through one source might result in common method variance. Future research should consider using a longitudinal research design alongside other data collection methods.

References

- [1] Liu, S. S., Pei, J. L., & Zhong, C. Y. (2021). Are platform jobs autonomous? The impact of algorithmic management of online labor platforms on work autonomy. *Foreign Economics & Management*, (2), 51-67. <https://doi.org/10.16538/j.cnki.fem.20200811.301>
- [2] De Stefano, V. (2016). The rise of the "just-in time workforce": On demand work, crowdwork, and labor protection in the "gig economy". *Comparative Labor Law and Policy Journal*, 37(3), 461-471.
- [3] Wood, A. J., Graham, M., Lehtonvirta, V., & Hjorth, I. (2019). Good gig, bad gig: Autonomy and algorithmic control in the global gig economy. *Work, Employment and Society*, 33(1), 56-75.
- [4] Kihwa, S. (2022). The Gig Economy & Algorithmic Management; A Modern Version of Scientific Management? A Digital Taylorism?.
- [5] Mbare, B., Perkiö, M., & Koivusalo, M. (2024). Algorithmic management, wellbeing and platform work: Understanding the psychosocial risks and experiences of food couriers in Finland. *Labour and Industry*, 34(4), 386-411.
- [6] Chen, L. (2020). Labor order under "digital control"—A study on labor control of takeaway riders. *Sociological Studies*, (6), 113-135. <https://doi.org/10.19934/j.cnki.shxyj.2020.06.006>
- [7] Luo, H. X. (2023). Dilemmas and solutions for identifying labor relations in platform employment from the perspective of algorithmic control. *SJTU Law Review*, (2), 74-88. <https://doi.org/10.19375/j.cnki.31-2075/d.2023.02.001>
- [8] Goods, C., Veen, A., & Barratt, T. (2019). "Is your gig any good?" Analysing job quality in the Australian platform-based food-delivery sector. *Journal of Industrial Relations*, 61(4), 502-527.
- [9] Parent-Rocheleau, X., & Parker, S. K. (2022). Algorithms as work designers: How algorithmic management influences the design of jobs. *Human Resource Management Review*, 32(3), 100838.
- [10] Li, B. A., & Ye, J. T. (2023). Legal dilemmas and solutions for trade union formation in the intelligent platform economy. *Journal of Hefei University of Technology (Social Sciences Edition)*, (3), 51-61.
- [11] Kellogg, K. C., Valentine, M. A., & Christin, A. (2020). Algorithms at work: The new contested terrain of control. *Academy of Management Annals*, 14(1), 366-410.
- [12] Wu, Q. J., & Li, Z. (2018). Labor control and work autonomy in the sharing economy: A mixed-methods study on the work of online ride-hailing drivers. *Sociological Studies*, (4), 137-162. <https://doi.org/10.19934/j.cnki.shxyj.2018.04.006>
- [13] Wood, A., Graham, M., Yan, Y. M., Shi, Z. X., Lehtonvirta, V., & Hjorth, I. (2022). Autonomy and algorithmic control in the global gig economy. *Foreign Social Sciences Frontiers*, (5), 43-57.
- [14] Zhou, L., Lei, X., Hou, R., & Chen, Y. (2022). Research on the negative impacts and control strategies of algorithmic management in online labor platforms: From the perspective of algorithmic technical attributes. *Human Resources Development of China*, (6), 8-22.
- [15] Jin, Z. J., Bian, X. N., Guan, Y. Y., & Yang, Q. (2023). A study on the influence mechanism of perceived algorithmic control on ride-hailing drivers' turnover intention in the gig economy era. In *Abstracts of the 25th National Academic Conference on Psychology: Poster Presentations* (pp. 236-238).
- [16] Deci, E. L., & Ryan, R. M. (2013). *Intrinsic motivation and self-determination in human behavior*. Springer Science & Business Media.
- [17] Gagné, M., Parker, S. K., Griffin, M. A., Dunlop, P. D., Knight, C., Klonek, F. E., & Parent-Rocheleau, X. (2022). Understanding and shaping the future of work with self-determination theory. *Nature Reviews Psychology*, 1(7), 378-392.
- [18] Hagger, M. S., Koch, S., & Chatzisarantis, N. L. (2015). The effect of causality orientations and positive competence-enhancing feedback on intrinsic motivation: A test of additive and interactive effects. *Personality and Individual Differences*, 72, 107-111.
- [19] Zhou, X. J., Fu, F. L., & Hu, N. (2024). Algorithmic management and intrinsic motivation in the gig economy: A study based on self-determination theory. *Journal of Hefei University of Technology (Social Sciences Edition)*, (3), 34-44.
- [20] Deci, E. L., Olafsen, A. H., & Ryan, R. M. (2017). Self-determination theory in work organizations: The state of a science. *Annual Review of Organizational Psychology and Organizational Behavior*, 4, 19-43.
- [21] Griesbach, K., Reich, A., Elliott-Negri, L., & Milkman, R. (2019). Algorithmic control in platform food delivery work.

Socius, 5, 2378023119870041.

- [22] Lu, S. (2020). Algorithmic opacity, private accountability, and corporate social disclosure in the age of artificial intelligence. *Vanderbilt Journal of Entertainment & Technology Law*, 23, 99.
- [23] Chen, L. (2022). Labor order under digital control: Research on labor control of take-out platform riders. *The Journal of Chinese Sociology*, 9(1), 17.
- [24] Pei, J. L., Liu, S. S., Cui, X., & Qu, J. J. (2021). Gig workers' perceived algorithmic control: Conceptualization, measurement, and verification of its impact on service performance. *Nankai Business Review*, 24(6), 14-27.
- [25] Zhang, Y., Li, D., & Liu, S. (2024). Time evolution analysis of riders' preference attention and satisfaction on real-time crowdsourcing logistics platform. *SAGE Open*, 14(3), 21582440241271145.
- [26] Rabbi, M., Pfammatter, A., Zhang, M., Spring, B., & Choudhury, T. (2015). Automated personalized feedback for physical activity and dietary behavior change with mobile phones: A randomized controlled trial on adults. *JMIR mHealth and uHealth*, 3(2), e4160.
- [27] Wu, X., Liu, Q., Qu, H., & Wang, J. (2023). The effect of algorithmic management and workers' coping behavior: An exploratory qualitative research of Chinese food-delivery platform. *Tourism Management*, 96, 104716.
- [28] Zerilli, J., Knott, A., Maclaurin, J., & Gavaghan, C. (2019). Algorithmic decision-making and the control problem. *Minds and Machines*, 29(4), 555-578.
- [29] Dong, J., Zhang, G., & Wu, L. (2025). Life against algorithmic management: A study on burnout and its influencing factors among food delivery riders. *Frontiers in Public Health*, 13, 1531541.
- [30] Maier, C., Thatcher, J. B., Grover, V., & Dwivedi, Y. K. (2023). Cross-sectional research: A critical perspective, use cases, and recommendations for IS research. *International Journal of Information Management*, 70, 102625.
- [31] Lang, J. J., Yang, L. F., Cheng, C., Cheng, X. Y., & Chen, F. Y. (2023). Are algorithmically controlled gig workers deeply burned out? An empirical study on employee work engagement. *BMC Psychology*, 11(1), 354.
- [32] Sun, G. (2023). Quantitative analysis of online labor platforms' algorithmic management influence on psychological health of workers. *International Journal of Environmental Research and Public Health*, 20(5), 4519.
- [33] Hair, J. F. (2009). *Multivariate data analysis*.
- [34] Van den Broeck, A., Vansteenkiste, M., De Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the Work-related Basic Need Satisfaction scale. *Journal of Occupational and Organizational Psychology*, 83(4), 981-1002.
- [35] Gagné, M., Forest, J., Vansteenkiste, M., Crevier-Braud, L., Van den Broeck, A., Aspel, A. K., ... & Westbye, C. (2015). The Multidimensional Work Motivation Scale: Validation evidence in seven languages and nine countries. *European Journal of Work and Organizational Psychology*, 24(2), 178-196.
- [36] Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. *Journal of Applied Psychology*, 88(5), 879-903.
- [37] Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, 18(1), 39-50.
- [38] Challender, L., & Viskum, T. (2025). A comparative study of algorithmic management and control mechanisms. A platform-centric review, comparing food delivery platforms in the UK and Sweden.
- [39] Liang, Y., Luo, H., Duan, H., Li, D., Liao, H., Feng, J., ... & Wang, L. (2024). Meituan's real-time intelligent dispatching algorithms build the world's largest minute-level delivery network. *INFORMS Journal on Applied Analytics*, 54(1), 84-101.
- [40] Huang, K., & Sun, Y. (2024). Resolution of labour disputes involving new forms of employment in China (No. 126). ILO Working Paper.
- [41] Wu, P. F., Zheng, R., Zhao, Y., & Li, Y. (2022). Happy riders are all alike? Ambivalent subjective experience and mental well-being of food-delivery platform workers in China. *New Technology, Work and Employment*, 37(3), 425-444.
- [42] Walker, M., Fleming, P., & Berti, M. (2021). 'You can't pick up a phone and talk to someone': How algorithms function as biopower in the gig economy. *Organization*, 28(1), 26-43.
- [43] Yan, J. (2025). From algorithmic control to psychological motivation: Reflection and reconstruction of incentive mechanisms for platform riders. *Capital University of Economics and Business*. <https://doi.org/10.54254/2754-1169/2025.LH25609>
- [44] Jarrahi, M. H. (2018). Artificial intelligence and the future of work: Human-AI symbiosis in organizational decision making. *Business horizons*, 61(4), 577-586.
- [45] Lehdonvirta, V. (2018). Flexibility in the gig economy: managing time on three online piecework platforms. *New Technology, Work and Employment*, 33(1), 13-29.
- [46] Lin, Q., Sun, R., & Zhu, Q. (2025). Perceived algorithmic control and gig workers' work engagement: assessing the mediating role of psychological empowerment and the moderating effect of deep acting. *BMC psychology*, 13(1), 1237.
- [47] Wood, A. J., Graham, M., Lehdonvirta, V., & Hjorth, I. (2019). Networked but commodified: The (dis) embeddedness of digital labour in the gig economy. *Sociology*, 53(5), 931-950.

- [48] Rosenblat, A. (2018). *Uberland: How algorithms are rewriting the rules of work*. Univ of California Press.
- [49] Möhlmann, M., & Zalmanson, L. (2017). Hands on the wheel: Navigating algorithmic management and Uber drivers' autonomy. In *Proceedings of the International Conference on Information Systems (ICIS)*, Seoul, South Korea (pp. 10-13).
- [50] Bond, M. H., & Hwang, K. K. (1986). *The social psychology of Chinese people*. Oxford University Press.
- [51] Adler, P. S., & Borys, B. (1996). Two types of bureaucracy: Enabling and coercive. *Administrative Science Quarterly*, 61-89.
- [52] Xie, X. Y., Zuo, Y. H., & Hu, Q. J. (2021). Human resource management in the digital era: A perspective based on human-technology interaction. *Management World*, 37(1), 200–216. <https://doi.org/10.19744/j.cnki.11-1235/f.2021.0013>