



Objectification at work: The impact of algorithmic management on employee work engagement

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ABSTRACT

With the increasing prevalence of digital and intelligent management, the impact of algorithmic management on employees' psychology and behavior has become a focus of scholarly attention. However, existing research predominantly views algorithmic management as a stressor from cognitive or emotional perspectives, leaving its profound impact on employees' self-concept underexplored. Drawing on social identity theory, this paper constructs a model of "algorithmic management—workplace objectification perception—employee work engagement" from the perspective of identity threat and empirically tests it using two-wave questionnaire data from 383 respondents. The findings reveal that algorithmic management is significantly negatively correlated with work engagement and that workplace objectification perception mediates this relationship. Specifically, algorithmic management is associated with employees' perception of workplace objectification by reinforcing their sense of instrumental value and powerlessness, which may deny their uniqueness and agency as human beings and is associated with diminished work engagement. This study not only enriches theoretical insights into algorithmic management and employee work engagement but also offers a new theoretical lens for understanding the potential side effects of technology-enabled management. Furthermore, it provides empirical references for organizations to optimize algorithmic management practices and balance efficiency enhancement with employee care, offering valuable implications for developing a technology-for-good paradigm in modern organizational management.

1. Introduction

With the rapid advancement of artificial intelligence (AI), big data, and digital technologies, algorithmic management—characterized by the use of software and digital tools to guide, evaluate, and optimize labor processes—is progressively being implemented across various facets of organizational management (Zhao & Ma, 2024). By enabling real-time monitoring of work processes and outcomes, algorithmic management facilitates task automation and precise performance evaluation, thereby significantly enhancing managerial efficiency and the scientific rigor of decision-making (Chen, Qu, et al., 2025). In recent years, this novel management approach has not only gained widespread application in the traditional gig economy sector (Zhang, Guo, et al., 2024) but has also rapidly expanded into knowledge-intensive industries (Zheng, 2025). However, while optimizing operational workflows, the inherent characteristics of algorithmic management—such as its lack of interpersonal interaction and limited flexibility—have also engendered issues including diminished employee autonomy, neglect of

emotional needs, and performance anxiety (Luo et al., 2025). Consequently, an increasing number of organizations have come to recognize that algorithmic management, alongside its efficiency-enhancing benefits, can exert a notable influence on employees' psychological states and behavioral outcomes.

Previous studies, largely grounded in Conservation of Resources Theory and the Cognitive-Transactional Model of Stress, suggest that algorithmic management diminishes work engagement by reducing job autonomy and increasing hindrance stressors (Li, 2024; Li, Lu, et al., 2024; Liu et al., 2011; Luo et al., 2025). Other research, from cognitive and affective perspectives, has found that algorithmic management leads to resource depletion, intensifies cognitive load, and triggers emotional exhaustion, prompting individuals to reduce their work engagement as a means of conserving resources (Zhang, Li, & Meng, 2024). However, these studies largely regard changes in work engagement as a passive response to stress or resource loss. Consequently, they fail to address the profound impact of algorithmic management on employees' self-concept, thereby overlooking individuals' fundamental

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resistance, as active agents, to being managed and utilized as mere tools.

To address the limitations of existing research, this study draws on social identity theory to explore the relationship between algorithmic management, workplace objectification perception, and employee work engagement from the perspective of identity threat. Social identity theory posits that individuals construct and maintain a positive self-concept through group membership (Tajfel & Turner, 1979). Algorithmic management tends to reduce complex labor processes to rigid quantitative indicators. By objectifying and datifying individuals, this managerial logic readily provokes fundamental doubts among employees about whether they are regarded as autonomous persons with independent personalities. In organizational contexts, an employee's work identity constitutes a significant component of their overall self-concept, and individuals possess an inherent instinct to preserve a positive self-image (Ashforth & Mael, 1989). When workplace objectification perception leads employees to perceive themselves as being treated by supervisors, colleagues, the organization, or even algorithms as mere tools or resources—rather than as complete human beings endowed with thoughts, emotions, and autonomy (Auzoult & Personnaz, 2016)—their identity as persons is severely threatened. This perceived threat is subsequently associated with a series of cognitive, affective, and behavioral responses linked to diminished work engagement (Baldissarri & Andrighetto, 2021; Sainz & Baldissarri, 2021).

In summary, this study aims to introduce social identity theory to better elucidate the psychological mechanism underlying the negative correlation between algorithmic management and employee work engagement. From the perspective of individual subjectivity, it explains that employees' reduction in work engagement is not merely a passive manifestation of “fatigue” or “unhappiness” but rather an active defense mechanism employed to counteract objectifying labels, safeguard human dignity, and preserve a positive self-image. This research will offer a novel theoretical perspective for understanding human–machine relationships in the digital age and provide more nuanced theoretical guidance for organizations seeking to optimize algorithmic management practices while balancing efficiency enhancement with employee care.

2. Research hypotheses

2.1. Algorithmic management and work engagement

Algorithmic management employs advanced data analytics to reshape traditional management models through automated decision-making, real-time monitoring, and dynamic optimization. It can rapidly process large volumes of data in real time, thereby enabling more accurate oversight at any time and in any location, and has been widely applied in organizations (Li, Liu, et al., 2024). Algorithmic management has a dual nature. On the one hand, it can enhance organizational efficiency; on the other hand, it also entails risks such as a lack of transparency, declining employee motivation, and organizational injustice (Barreno-Alcalde et al., 2026). At the individual level, algorithm-driven approaches can reduce employees' job burnout through streamlined processes and timely feedback mechanisms, but they are unable to mitigate the negative effects of algorithmic evaluation and algorithmic discipline (Peng et al., 2025). Employees' perceived algorithmic control increases work engagement through promotion-focused job crafting and decreases work engagement through prevention-focused job crafting. However, the mediating effect of the former is weaker than that of the latter, resulting in an overall negative effect of perceived algorithmic control on employee work engagement (Zhu et al., 2025).

In the gig economy, algorithmic management enhances organizational efficiency through real-time monitoring and data feedback. However, its stringent control mechanisms tend to engender negative consequences at both the organizational and individual levels (Bao et al., 2024; Delgosha & Hajiheydari, 2026), such as work-related stress (Ma et al., 2024), job insecurity (Hajiheydari & Delgosha,

2024), cognitive load, and emotional exhaustion (Zhang, Li, & Meng, 2024). When employees perceive algorithmic control as a hindrance stressor (Li, Lu, et al., 2024; Liu et al., 2011), they are likely to experience negative emotions such as anxiety, tension, and resentment (Kadolkar et al., 2025; Shetzer, 1993; Zalesny & Ford, 1990), which may generate negative attitudes toward algorithms (Jarrahi et al., 2021) and prompt resistant behaviors (Kellogg et al., 2020; Möhlmann et al., 2021), ultimately diminishing their work engagement.

However, examining algorithmic management solely within the context of the gig economy has its limitations. To achieve a comprehensive understanding of algorithmic management, the scope of inquiry should be extended to different industries (Yu & Shi, 2025). In knowledge-intensive enterprises, the stronger employees' perception of algorithmic management is, the lower their level of creativity (Li, Liu, et al., 2024). Electronic monitoring diminishes employees' trust in management (Holland et al., 2015), which constitutes a significant factor contributing to reduced work engagement. For instance, observational monitoring undermines work engagement by impairing affective trust (Wang et al., 2022). Furthermore, drawing on cognitive appraisal theory, some scholars suggest that algorithmic management is predominantly appraised by employees as a threat or hindrance and that its negative impact on work engagement outweighs any potential positive effects arising from challenge appraisals (Li, Lu, et al., 2024).

In summary, when organizations employ algorithmic technologies to manage employees, the automation of algorithms replaces certain human–machine interactions. Consequently, employees may perceive a sense of surveillance and constraint, which predicts lower levels of work engagement. Based on this, we propose the following hypothesis:

H1. Algorithmic management is significantly negatively correlated with work engagement.

2.2. Mediating role of workplace objectification perception

Workplace objectification perception refers to employees' perception that they are treated as instruments or resources for achieving specific goals by the organization, supervisors, colleagues, or even algorithmic systems (Arora et al., 2025). Its essential characteristics include instrumentality, deprivation of agency, and negation of experience (Zhang et al., 2025), and its core attributes comprise two dimensions: instrumental value and powerfulness (Crone et al., 2021). Conceptually, it is fundamentally distinct from organizational dehumanization, identity threat, and reduced autonomy.

Organizational dehumanization focuses on the mechanized experience of employees who are stripped of human attributes by the organization (Caesens et al., 2017). In contrast, workplace objectification perception encompasses a more diverse range of actors and places greater emphasis on instrumentality as a core dimension (Zhang et al., 2025). Identity threat centers on individuals' experience of threats to self-worth, meaning, status, and group distinctiveness (Ashraf et al., 2026; Chen, Lai, et al., 2025; Johnson et al., 2025), whereas workplace objectification perception underscores the ontological degradation associated with being deprived of agency and humanity and being treated as an instrument (Zhang et al., 2025), thus constituting a specific form of identity threat. Reduced autonomy refers to the diminished discretionary control employees have over work methods, schedules, and standards (Breagh, 1985; Van Zoonen et al., 2025), while workplace objectification perception transcends the domain of control, representing a profound negation and erosion of employees as agents (Zhang et al., 2025). In summary, workplace objectification perception integrates the dual dimensions of instrumental value and powerfulness, thereby capturing employees' subjective experience of being treated as instruments in the context of algorithmic management more profoundly and offering a unique theoretical perspective for explaining employees' deep-seated alienation (Arora et al., 2025; Yang et al., 2025).

The essence of algorithmic management is evaluating employee

performance through quantitative indicators and data analytics. This management model narrows employee value to their quantifiable output, neglecting nonquantifiable attributes such as individual complexity, creativity, emotional labor, and interpersonal interactions (Arora et al., 2025). When employees are persistently exposed to the message that they are merely tools for achieving KPIs, they perceive themselves as being stripped of the unique qualities inherent to human beings. They experience a loss of humanity, autonomy, and subjectivity, as they are regarded merely as instruments for attaining predetermined goals. In such circumstances, others perceive only their occupational attributes, and their instrumental value is elevated (Auzoult, 2020; Baldissarri et al., 2020; Orehek & Weaverling, 2017).

Algorithmic management is often accompanied by a high degree of automated decision-making and stringent process control, which substantially reduces employees' voice and autonomy in task allocation, work methods, and even performance appeals (Arora et al., 2025). When algorithmic systems mandatorily prescribe work procedures, monitor progress in real time, and automatically evaluate performance, employees perceive their own agency as being completely negated to the extent that they are relegated to a status inferior to machines or reduced to mere physical functions (Baldissarri et al., 2022; Crone et al., 2021). This occurs because individuals in work settings employ calculative and strategic thinking to navigate and act within their environment, a mode of thinking that is continuously transmitted, reinforced, and even rewarded. This process triggers and intensifies workplace objectification perception (Belmi & Schroeder, 2021).

By threatening employees' uniqueness and negating their agency, algorithmic management makes it difficult for them to establish and maintain a positive self-concept at work, and is associated with a certain erosion of identity. This process is associated with elevated perceived instrumental value and diminished sense of powerfulness. According to social identity theory, workplace objectification is not merely a form of resource deprivation or emotional distress but a fundamental denial and devaluation of employees' human identity. Both algorithmic management practices and artificial intelligence adoption treat employees as replaceable tools or calculable data, which in effect overlooks their uniqueness, agency, and wholeness, undermining their value as human beings (Chen, Lai, et al., 2025; Yang et al., 2025). This objectifying process directly threatens employees' positive work identity, hinders their ability to sustain a positive self-concept in the workplace and thereby triggers identity threat (Ashraf et al., 2026; Chen, Lai, et al., 2025; Hogg & Terry, 2000; Van Knippenberg, 2000). Therefore, workplace objectification perception can be understood as an experience of identity devaluation in which employees perceive their human identity as stripped away by the organization, supervisors, or colleagues within the work environment.

This experience can erode employees' trust in the organization (Väyrynen & Laari-Salmela, 2018), thereby reducing positive communication with the organization, and may even trigger tit-for-tat retaliatory behaviors by diminishing their work engagement (Khan et al., 2024; Stinglhamber et al., 2023). In more extreme cases, employees may resort to self-objectification as a means of adapting to the organization (Baldissarri et al., 2020; Zhang, Cheng, et al., 2024), developing conformity tendencies, and gradually acquiescing to exploitation and oppression by the organization or supervisors (Andrighetto et al., 2018). Such instrumental treatment induces employees to objectify themselves, thereby reducing their work engagement and impairing their job performance (Baldissarri & Andrighetto, 2021; Yu & Shi, 2025).

The application of algorithmic management can amplify perceived hierarchical differences among employees. In the exercise of power, the attitudes and behaviors of supervisors can subject employees to varying degrees of objectification. When employees experience abusive supervision—defined as the perception of sustained verbal or nonverbal hostile behaviors from supervisors—they feel treated as mere objects by the organization. This perception generates negative consequences for both individuals and the organization, manifesting in reduced job

satisfaction and well-being, increased physical stress and turnover intentions, and diminished work engagement, among other outcomes (Brison et al., 2024; Caesens et al., 2019; Sainz & Baldissarri, 2021).

In summary, when individuals perceive a threat to their core identity, they adopt a series of coping strategies to maintain a positive self-concept. Workplace objectification perception, as an experience of identity devaluation, signifies that employees perceive themselves as being treated as tools or resources within the work environment rather than as complete individuals. This objectifying experience directly assaults employees' ontological security and sense of self-worth. To cope with such profound identity threat, employees may adopt defensive withdrawal strategies, among which reduced work engagement is one manifestation. Based on the above analysis, we propose the following hypothesis:

H2. Workplace objectification perception mediates the association between algorithmic management and employee work engagement.

H2a. Instrumental value mediates the association between algorithmic management and employee work engagement.

H2b. Powerfulness mediates the association between algorithmic management and employee work engagement.

Integrating the research hypotheses above, the theoretical model of this study is proposed, as shown in Fig. 1.

3. Research methods

3.1. Research subjects and survey process

Before conducting the investigation, we applied for ethical approval. We obtained institutional review board (IRB) approval from the University of Science & Technology Beijing (IRB #2024-4-17). All data were kept secure and confidential.

This study selected employees from Chinese knowledge-intensive enterprises as survey respondents. This sample selection was based on the following theoretical and practical considerations. First, prior research on algorithmic management has largely been confined to the gig economy or platform labor context (Delgosha & Hajihedari, 2026). However, with rapid technological advancement, a comprehensive understanding of the impact of algorithmic management urgently requires extending the scope of inquiry from the gig economy to a broader range of industry contexts (Yu & Shi, 2025). Second, although the negative effects of algorithmic management have drawn initial attention in traditional industries such as manufacturing (Zayid et al., 2024), knowledge workers typically possess stronger needs for autonomy and professional identity and are more sensitive to covert control, which may differentiate them from traditional workers or gig workers. Existing research has shown that even in knowledge-intensive industries, algorithmic management significantly suppresses employees' positive work outcomes (Li, Liu, et al., 2024). Therefore, by using employees from Chinese knowledge-intensive enterprises as the sample, this study aims not only to test whether the objectifying effect of algorithmic management is equally pronounced among occupational groups characterized by high autonomy needs and high skills but also to verify that algorithmic management's deep-seated threat to employee agency is not a localized phenomenon confined to specific industries but rather a management side effect with cross-industry generalizability.

To reduce common method bias and strengthen the empirical robustness of the proposed associations, a two-wave data collection approach was adopted. The two surveys were conducted three weeks apart, both administered via the Credamo platform. The first wave measured algorithmic management and control variables. For the second wave, the platform was used again to distribute the questionnaire link to the same initial respondents, measuring workplace objectification perception and work engagement. A total of 411 questionnaires were collected. After excluding those with logical inconsistencies,

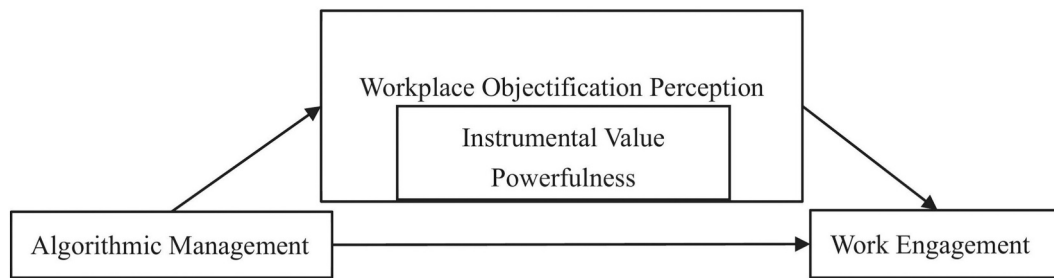


Fig. 1. Research model diagram.

identical answers across all items, or patterned responses, 383 valid questionnaires were retained, resulting in a valid response rate of 93.19%. Sample characteristics are presented in Table 1.

3.2. Measurement tools

This study employed a questionnaire survey as the primary method for data collection, with the design process detailed as follows. The questionnaire covered respondents' basic demographic information and included items from established scales measuring algorithmic management, work engagement, and workplace objectification perception. This approach ensures high reliability and validity while being suitable for the Chinese context. All scales utilized a 7-point Likert scale.

Algorithmic management was measured using the scale developed by Parent-Rocheleau et al., which comprises five dimensions: algorithmic monitoring, algorithmic goal setting, algorithmic scheduling, algorithmic performance rating, and algorithmic compensation, totaling 20 items. Examples include: "An automated system tracks me carefully to ensure I am completing my tasks." and "An automated system closely monitors me while I am doing my work." (Parent-Rocheleau et al., 2024). In this study, Cronbach's α coefficient for this scale was 0.767.

Work engagement was measured using the optimized Utrecht Work Engagement Scale (UWES-9) by Schaufeli et al. This scale includes three dimensions: vigor, dedication, and absorption, with a total of 9 items. Example items are "At my work, I feel bursting with energy." and "At my job, I feel strong and vigorous." (Schaufeli et al., 2006). In this study, the Cronbach's α coefficient for this scale was 0.840.

This study measured workplace objectification perception using a self-report method, a choice grounded in rigorous conceptual definition and psychometric considerations. First, according to the classification by Zhang et al. (2025), research on workplace objectification encompasses three perspectives: objectifying others, self-objectification, and experiencing objectification. The core construct of this study focuses on

experiencing objectification, that is, employees, as target objects, subjectively perceive the extent to which they are treated as instruments by the organization or others. Because objectification is not merely an objective interactive behavior but also involves the deep psychological experience of being deprived of agency, external observation can hardly accurately gauge the psychological reactions of those being targeted. Second, the reliability of employees' self-reported experiences of objectification has been supported. In a psychometric review conducted by Jenkins et al. (2026) using the COSMIN criteria, the POWS scale (Crone et al., 2021) was explicitly recommended as a measure of objectification perception due to its good content validity, construct validity, and internal consistency.

Based on this, workplace objectification perception was measured using the scale optimized by Crone et al., which consists of two dimensions: instrumental value and powerfulness, totaling 10 items. Examples include "My boss and/or my colleagues think more about what I can do for them than what they can do for me." and "At work, my boss and/or my colleagues give me the impression that my work could be replaced by that of a machine." (Crone et al., 2021). In this study, the Cronbach's α coefficient for this scale was 0.829.

In this study, gender, age, education level, and job tenure were included as control variables.

3.3. Statistical analysis

Empirical analysis was conducted using SPSS 19.0 and Mplus 8.3. First, Harman's single-factor test was employed to assess potential common method bias. Second, confirmatory factor analysis (CFA) was performed via Mplus 8.3 to evaluate the measurement model's validity. Third, Pearson correlation analysis was utilized to examine the associations among the variables. Finally, structural equation modeling (SEM) was estimated using Mplus 8.3 to test the hypothesized links and derive path coefficients. A bootstrapping procedure (5000 resamples) was applied to verify the significance of the indirect associations.

4. Research results

4.1. Common method bias test

To mitigate potential common method bias, procedural remedies such as anonymous data collection and a two-wave survey design were implemented. The data were subsequently evaluated for this bias using SPSS 19.0. Table 2 presents the unrotated factor solution. Ten factors with eigenvalues greater than 1 were extracted, with the first factor explaining only 16.640% of the total variance. As this falls well below the commonly accepted threshold of 40%, it suggests that common method bias does not pose a substantial threat to the validity of this study.

4.2. Validity analysis

This study examined the validity of the measurement model by conducting confirmatory factor analysis (CFA) on the dimensions of the

Table 1
Demographic characteristics of the sample.

Characteristic	Category	Sample Count	Proportion (%)
Gender	Male	187	48.80
	Female	196	51.20
Age	21–30 years old	122	31.90
	31–40 years old	116	30.30
	41–50 years old	106	27.70
	51 years old and above	39	10.20
	Junior High School and Below	47	12.30
Education Level	Vocational School and High School	42	11.00
	College	109	28.50
	Undergraduate	146	38.10
	Postgraduate	39	10.20
	5 years and below	186	48.60
Job Tenure	5–10 years	99	25.80
	10–15 years	59	15.40
	15 years and above	39	10.20

Table 2

Results of the common method bias test.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	6.490	16.640	16.640	6.490	16.640	16.640
2	3.676	9.424	26.065	3.676	9.424	26.065
3	3.540	9.077	35.142	3.540	9.077	35.142
4	2.850	7.309	42.451	2.850	7.309	42.451
5	2.455	6.295	48.747	2.455	6.295	48.747
6	2.144	5.498	54.245	2.144	5.498	54.245
7	2.079	5.331	59.576	2.079	5.331	59.576
8	1.796	4.606	64.182	1.796	4.606	64.182
9	1.762	4.518	68.700	1.762	4.518	68.700
10	1.441	3.696	72.396	1.441	3.696	72.396

variables. Using Mplus 8.3, the code for each factor model was specified and estimated. The results are presented in Table 3. A comparison of the factor models revealed that the four-factor model demonstrated the best fit, with its fit indices being significantly superior to those of other models ($\chi^2 = 842.476$, $df = 688$, $RMSEA = 0.024$, $SRMR = 0.054$, $TLI = 0.979$, $CFI = 0.981$). Therefore, it can be concluded that the four variables in this study possess good discriminant validity.

4.3. Correlation analysis

Correlation analysis measures the relationships between variables. Table 4 presents the results of the correlation analysis for algorithmic management, workplace objectification perception, instrumental value, powerfulness, and work engagement. Algorithmic management is significantly correlated with workplace objectification perception, instrumental value, powerfulness, and work engagement at the 5% significance level. Specifically, algorithmic management shows positive correlations with workplace objectification perception ($r = 0.222$, $p < 0.01$), instrumental value ($r = 0.205$, $p < 0.01$), and powerfulness ($r = 0.123$, $p < 0.05$), while it is negatively correlated with work engagement ($r = -0.307$, $p < 0.01$). Furthermore, workplace objectification perception ($r = -0.395$, $p < 0.01$), instrumental value ($r = -0.283$, $p < 0.01$), and powerfulness ($r = -0.292$, $p < 0.01$) are all negatively correlated with work engagement, providing preliminary support for the hypotheses. Additionally, with the exception of the correlations between workplace objectification perception and its two dimensions, the correlation coefficients among all other variables are below 0.7, indicating that the variables are not highly correlated.

4.4. Hypothesis testing

This study employed Mplus 8.3 to construct a structural equation model to test the hypothesized associations. The standardized path coefficients and their significance levels are depicted in Fig. 2.

As shown in Fig. 2, algorithmic management is significantly negatively correlated with work engagement ($\beta = -0.237$, $SE = 0.052$, $p < 0.001$), supporting H1. To verify that workplace objectification

perception, instrumental value, and powerfulness mediate the relationship between algorithmic management and work engagement, this study utilized the bootstrap method to test the mediating effects (bootstrap = 5000). This method was used to obtain parameter estimates and their 95% confidence intervals; an effect is considered significant if its confidence interval does not include zero. As shown in Table 5, the confidence intervals for the total effect, the direct effect, and the three mediating effects all exclude zero. Furthermore, the direct effect (-0.400) and the three mediating effects (-0.047 , -0.051 , and -0.035) account for 75.19%, 8.83%, 9.59%, and 6.58% of the total effect (-0.532), respectively. These results suggest that workplace objectification perception, instrumental value, and powerfulness each play a partial mediating role in the relationship between algorithmic management and work engagement, thereby supporting H2, H2a, and H2b.

5. Discussion

5.1. Research conclusions

Based on social identity theory, this study explores the mechanism through which algorithmic management is associated with employee work engagement from the perspective of identity threat, as well as the mediating role of workplace objectification perception (instrumental value and powerfulness) in this relationship. The following results emerged.

First, algorithmic management is significantly negatively correlated with employee work engagement. Consistent with previous scholarly research, algorithmic management diminishes employee work engagement (Li, 2024; Li, Lu, et al., 2024; Liu et al., 2011; Ma et al., 2024; Zhang, Li, & Meng, 2024). The point of divergence lies in the fact that some scholars have found that employees' perception of algorithmic control reduces their trust in organizational commitment, consequently leading to decreased job satisfaction, well-being, performance, and work engagement (Bao et al., 2024). In contrast, drawing on social identity theory, this study posits that individuals incorporate organizational membership into their self-concept through organizational identification. This identification not only influences employees' self-perception,

Table 3

Confirmatory factor analysis results.

Model	χ^2	df	$\Delta\chi^2(\Delta df)$	RMSEA	SRMR	TLI	CFI
Four-Factor Model	842.476	688	–	0.024	0.054	0.979	0.981
Three-Factor Model	1375.268	691	534.992(3)***	0.051	0.073	0.909	0.915
Two-Factor Model 2	3304.865	696	2464.589(8)***	0.099	0.110	0.655	0.676
Two-Factor Model 1	5098.439	698	4258.163(10)***	0.128	0.139	0.420	0.454
Single-Factor Model	6974.026	702	6133.750(14)***	0.153	0.154	0.178	0.221

Note: The four-factor model includes algorithmic management, instrumental value, powerfulness, and work engagement. The three-factor model combines instrumental value and powerfulness into one factor. The two-factor model 2 combines instrumental value, powerfulness, and work engagement into one factor. The two-factor model 1 combines algorithmic management, instrumental value, and powerfulness into one factor. The single-factor model combines all four variables: algorithmic management, instrumental value, powerfulness, and work engagement.

*** indicates $p < 0.001$.

Table 4
Descriptive statistical analysis.

	***Mean	Standard Deviation	1	2	3	4	5	6	7	8	9
1 Gender	1.510	0.501	1								
2 Age	2.160	0.989	−0.099	1							
3 Educational Level	3.230	1.157	−0.023	−0.117*	1						
4 Job Tenure	1.870	1.017	−0.149**	0.531**	−0.097	1					
5 Algorithmic Management	3.649	0.690	−0.019	0.076	0.000	−0.013	1				
6 Workplace Objectification Perception	3.629	0.992	0.078	0.008	−0.135**	−0.070	0.222**	1			
7 Instrumental Value	3.590	1.281	0.083	0.047	−0.081	−0.021	0.205**	0.687**	1		
8 Powerfulness	3.668	1.445	0.034	−0.031	−0.113*	−0.078	0.123*	0.765**	0.057	1	
9 Work Engagement	4.071	1.196	−0.014	−0.009	0.036	−0.005	−0.307**	−0.395**	−0.283**	−0.292**	1

Note: N = 383
*** indicates p < 0.001.
** indicates p < 0.01.
* indicates p < 0.05.

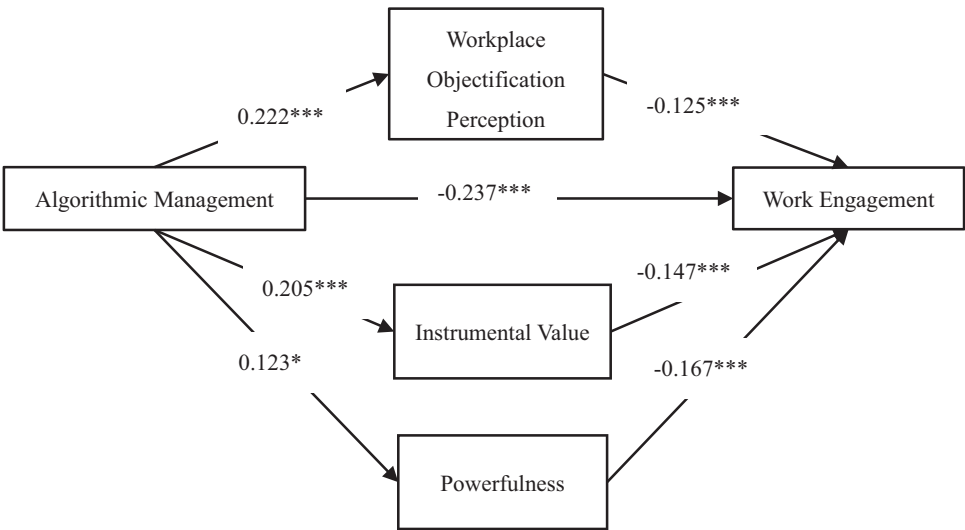


Fig. 2. Influence relationship diagram of each variable.

Table 5
Decomposition of total effect, direct effect, and mediating effects.

Path	Effect Value	Boot Standard Error	Boot CI Lower Limit	Boot CI Upper Limit	Relative Effect Value (Effect Proportion)
Total Effect	−0.532	0.096	−0.763	−0.276	
Direct Effect	−0.400	0.088	−0.615	−0.167	75.19%
Mediating Effect 1	−0.047	0.012	−0.084	−0.020	8.83%
Mediating Effect 2	−0.051	0.017	−0.110	−0.016	9.59%
Mediating Effect 3	−0.035	0.016	−0.086	−0.002	6.58%

Note: The total effect is the sum of all paths; the direct effect is algorithmic management → work engagement; Mediating Effect 1 is algorithmic management → workplace objectification perception → work engagement; Mediating Effect 2 is algorithmic management → instrumental value → work engagement; Mediating Effect 3 is algorithmic management → powerfulness → work engagement.

emotional experiences, and overall well-being but also profoundly affects work-related outcomes (Ashforth & Mael, 1989; Tajfel & Turner, 1979), and is linked to work engagement outcomes.

Second, workplace objectification perception and its two dimensions—instrumental value and powerfulness—partially mediate the relationship between algorithmic management and work engagement. Specifically, the extent to which employees perceive algorithmic

management is positively correlated with workplace objectification perception; employees are more likely to perceive instrumental treatment and powerfulness, which, in turn, is associated with decreased work engagement. This finding aligns with conclusions drawn by most existing studies. Some scholars have found that, driven by the wave of digital intelligence, when organizations implement algorithmic management, they tend to treat employees as sets of data to be processed. This management model engenders experiences of “dehumanization” among employees (Sparascio & Dal Lago, 2023), thereby diminishing their job satisfaction and affective commitment (Caesens et al., 2019) while simultaneously increasing production deviance behaviors such as excessive breaks, deliberately slowing down work pace, and engaging in nonwork-related activities during working hours (Du et al., 2025), ultimately reducing work engagement. Moreover, the rise of artificial intelligence, the infiltration of robots, and the implementation of algorithmic management can induce a sense of crisis among employees, thereby diminishing their sense of control and ultimately exacerbating workplace objectification (Xu et al., 2024). Concurrently, some scholars have discovered that when individuals exercise power, it can lead to the objectification of others (Crone et al., 2021). This occurs because, regardless of their power level, when individuals exercise power in work settings, they unconsciously employ calculative and strategic thinking to deliberate and make decisions—a mode of thinking that indirectly encroaches upon others' sense of power, thereby triggering and intensifying workplace objectification perception (Baldissarri et al., 2022; Belmi & Schroeder, 2021). This instrumental treatment, organizational

dehumanization, and power diminishment can, to some extent, induce self-objectification among employees, trigger physical tension, subsequently increase turnover intentions, and ultimately impair their job performance, thereby reducing their work engagement (Baldissarri & Andrighetto, 2021; Brison et al., 2024).

5.2. Theoretical contributions

First, this study extends the applicable boundary of workplace objectification perception into the digitally intelligent management context. Existing research on the antecedents of workplace objectification perception has largely focused on interpersonal interactions, such as workplace ostracism (Brison & Caesens, 2023), whereas this study introduces it into the context of algorithmic management, verifying the applicability of the dual dimensions of instrumental value and powerfulness. Furthermore, although previous research has found that algorithmic management enhances employees' objectifying cognition of others, thereby weakening prosocial motivation (Granulo et al., 2024), this still falls within the domain of objectifying others. In contrast, this study focuses on experiencing objectification, revealing the association between algorithmic management and the erosion of employees' powerfulness and ontological integrity, as well as decreased work engagement. The present study finds that algorithmic management not only induces employees' tendency to objectify others but also serves as an important factor in their experience of being objectified, thereby enriching research on the antecedents of employee alienation experience under technology-empowered management.

Second, this study reveals the psychological mechanism underlying the association between algorithmic management and employee work engagement, identifying and validating workplace objectification perception as a core mediating pathway. Although a substantial body of research has confirmed the relationship between algorithmic management and various employee outcomes, its mediating mechanisms remain underexplored (Kadolkar et al., 2025). Previous research on the impact of algorithmic management on work engagement has predominantly adopted perspectives centered on resource loss or task characteristics, focusing mediating mechanisms on role clarity and job autonomy (Luo et al., 2025), cognitive load and emotional exhaustion (Zhang, Li, & Meng, 2024), stress appraisals (Li, Lu, et al., 2024), and organizational-level affective commitment and trust (Wang et al., 2022). These perspectives treat algorithmic management as a functional stressor, explaining why employees become fatigued or depleted. In contrast, this study proposes workplace objectification perception as a novel mediating pathway, arguing that by encoding employees as calculable and replaceable data nodes, algorithmic management is associated with their deep-seated psychological experience of being instrumentalized and degraded, as well as with decreased work engagement. This offers a new explanatory path—distinct from conservation of resources theory and the stress and coping perspective—for understanding why algorithmic management is associated with lower work engagement.

Finally, this study introduces Social Identity Theory to reinterpret the connotation of workplace objectification perception from an identity threat perspective, thereby achieving a deep theoretical breakthrough. Prior studies examining the impact of algorithmic management often rely on Conservation of Resources Theory (Arora et al., 2025; Luo et al., 2025; Wang et al., 2022) or stress and coping theory and transactional stress theory (Li, Lu, et al., 2024; Liu et al., 2011), reducing the decline in work engagement to a mere act of energy conservation or stress avoidance. In contrast, this study introduces social identity theory and the identity threat perspective into this domain, elevating the explanatory focus from the resource and emotional levels to the ontological and existential levels, and posits that workplace objectification perception functions as an identity threat mechanism. When algorithmic management is deeply embedded in work processes, employees not only perceive resource loss but also experience existential anxiety stemming

from the loss of human uniqueness. Instrumental value challenges their irreplaceability, while powerfulness negates their fundamental dignity as agents (Crone et al., 2021); together, these two dimensions undermine the foundation on which employees construct a positive work self-concept (Ashforth & Mael, 1989; Tajfel & Turner, 1979). From this perspective, decreased work engagement may not simply be passive resignation but rather a form of covert resistance and dignity maintenance through which employees strive for the right to self-define and counteract instrumentalizing labels. This shift in perspective not only deepens the explanatory power of Social Identity Theory in the digital-intelligence era but also provides a new theoretical lens for future explorations of agency contestation in human-machine interaction.

5.3. Management implications

With the widespread application of algorithmic management, enterprises must confront its profound impact on employees' self-concept. To mitigate the workplace objectification perception associated with algorithmic management—which may in turn reduce work engagement—enterprises can optimize management practices in the following three ways.

First, enterprises should improve human-machine interaction design to alleviate employees' perceptions of instrumental value and powerfulness. When deploying algorithms, enterprises should abandon absolute automated control and adopt a partially automated design. For routine tasks, the algorithm system may provide data analysis and recommendations, but the final decision-making authority should remain with employees, positioning algorithms as a means to assist employees in their work and preventing employees from being viewed as mere tools for executing instructions. For high-stakes decisions such as performance evaluations and disciplinary actions for rule violations, manual intervention mechanisms must be mandatorily retained, and transparent and accessible appeal channels should be established to ensure employees have a voice, thereby fundamentally reducing the sense of deprivation of employee agency and autonomy associated with algorithmic management.

Second, enterprises should practice responsible algorithmic management and reduce identity threats through participatory governance. Enterprises can help employees understand the logic, principles, and standards of algorithmic management via measures such as onboarding training and mutual support programs between new and veteran employees, which may enhance algorithmic transparency and alleviate the uncertainty and panic associated with the algorithmic black box. At the same time, it is recommended that enterprises establish an algorithmic governance committee composed of frontline employees, technical teams, and management. This committee should regularly assess the extent of workplace objectification perception arising from algorithmic management through surveys, interviews, and other methods and implement one-on-one measures such as employee care and psychological counseling to help employees mitigate the impact of workplace objectification perception. Furthermore, enterprises should encourage employees to deeply participate in the introduction, design, and continuous optimization of algorithms, granting them cogovernance rights over algorithms, transforming them from passive recipients into coconstructors, and helping them find and realize their self-worth within the organization while reshaping a positive identity as human beings.

Finally, enterprises should strengthen human-centered care and establish an organizational management paradigm of “technology for good.” Enterprises need to deepen person-job fit by assessing the alignment between employees' abilities, values, and the intensity of algorithmic management. Employees with high algorithmic literacy should be granted greater task autonomy, while those with low algorithmic literacy should be provided with targeted technical training and emotional guidance to reduce their objectification experience resulting from a sense of loss of control. In addition, enterprises should preserve opportunities for employees to interact directly with leaders, colleagues,

and customers in work processes and strengthen offline social interactions through cross-departmental rotations, team-building activities, and the like. Such humanized interactions can serve as a buffer, alleviating the data-driven and instrumentalized experience brought by algorithmic management, enabling employees to affirm their emotions and value through interpersonal relationships, helping them maintain a positive self-concept, and thus allowing them to engage in work with greater vigor.

5.4. Limitations and future prospects

Although efforts were made to account for potential confounding factors, this study has certain limitations due to resource and scope constraints that future research should address:

First, regarding methodological limitations, data were primarily collected via self-report measures. This approach is susceptible to social desirability bias and introduces a potential risk of common method variance, which may obscure the true nature of the observed associations. Future research should consider leveraging objective behavioral data or big data analytics to ensure greater authenticity and objectivity. Additionally, focusing on samples from specific industries could enhance the contextual depth and practical relevance of the findings.

Second, although this study explored the mechanism through which algorithmic management is associated with employee work engagement—centering on the mediating role of the two dimensions of workplace objectification perception, namely, instrumental value and powerfulness—it did not incorporate potential moderating variables that might buffer the negative effects of algorithmic management. Examples include algorithm transparency, organizational support culture, and employee digital literacy. Future research should incorporate such factors to gain a comprehensive understanding of how different elements are jointly associated with employee work engagement, as well as the underlying driving and moderating mechanisms involved.

Finally, although a two-wave survey design was implemented, the data remain observational and rely on employee self-reports. Consequently, this study establishes statistical associations rather than definitive causal relationships, and the possibility of reverse causality cannot be entirely ruled out. For instance, employees with lower work engagement might be more inclined to perceive algorithmic management negatively. Similarly, individuals with a diminished self-concept may be more predisposed to perceive instrumental treatment and excessive power within algorithmic systems. Future research should therefore employ longitudinal tracking designs, experimental methodologies, or multi-source data to further clarify the causal directions among these variables.

CRedit authorship contribution statement

Na Zhang: Supervision, Project administration, Funding acquisition, Conceptualization. **Yunjing Zhang:** Writing – original draft, Validation, Methodology, Formal analysis. **Chunhua Jin:** Supervision, Resources, Project administration, Investigation.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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