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Algorithmic Management, Perceived Precarity, and Collective Identity Formation Among Indonesian Gig Economy Workers

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A B S T R A C T

This cross-sectional study examines the relationships between algorithmic management intensity, perceived precarity, digital literacy, and social identity transformation among Indonesian gig economy workers (n=324). Drawing on social identity theory and precarious work frameworks, we investigate how platform-mediated algorithmic control systems affect collective identity formation processes in one of Southeast Asia's largest digital labor markets. Participants were recruited from ride-hailing (n=128), food delivery (n=112), and freelance digital service (n=84) platforms in Jakarta and Surabaya. Four validated instruments measured algorithmic management intensity (16 items, α=0.89), perceived precarity (12 items, α=0.86), social identity transformation (20 items, α=0.91), and digital literacy (8 items, α=0.84). Hierarchical multiple regression analysis revealed that the combined model explained 41.8% of variance in social identity transformation (R^2=0.418, Adjusted R^2=0.395, F(15,308)=14.78, p<0.001, Cohen's f^2=0.718). The strongest predictors were automated deactivation threat (β=-0.385, p<0.001), performance rating pressure (β=-0.318, p<0.001), algorithmic surveillance (β=-0.267, p<0.001), and income instability (β=-0.209, p<0.001). Digital literacy emerged as a significant protective factor (β=0.198, p<0.001), suggesting that workers with greater digital competencies maintain stronger collective identities despite algorithmic pressures. These findings extend social identity theory to platform labor contexts and demonstrate that algorithmic management systems fundamentally disrupt traditional mechanisms of collective identity formation, with implications for worker organizing, platform governance, and labor policy in developing digital economies.

1. Introduction

The rapid expansion of the gig economy has fundamentally transformed employment relationships across the globe, challenging traditional conceptualizations of work, identity, and labor solidarity.[1] Platform-mediated labor arrangements, characterized by algorithmic management systems that coordinate, evaluate, and discipline workers through automated processes, represent a qualitatively distinct mode of work organization that disrupts established mechanisms through which workers develop collective consciousness and occupational identity.[2] This transformation carries particular significance for developing economies where platform labor has proliferated rapidly, often outpacing regulatory frameworks and institutional protections designed for traditional employment relationships.[3]

Indonesia exemplifies these dynamics as Southeast Asia's largest digital economy, where ride-hailing platforms such as Gojek and Grab have enrolled millions of workers since their emergence in 2015.[4] The Indonesian gig economy encompasses approximately 4.7 million active platform workers across ride-hailing, food delivery, and freelance digital services, constituting a significant and growing segment of the national labor force. These workers operate within algorithmic management systems that exercise control through mechanisms including automated performance evaluation, dynamic pricing

algorithms, incentive manipulation, and the ever-present threat of account deactivation without recourse to traditional grievance procedures.

Social identity theory provides a robust theoretical framework for understanding how individuals derive self-concept from group memberships and how threats to group identity precipitate identity management strategies.[5,6] Tajfel and Turner's foundational work established that social categorization, social comparison, and psychological distinctiveness constitute the core mechanisms through which individuals construct and maintain group-based identities.[5] Subsequent developments in organizational identity theory have extended these principles to occupational contexts, demonstrating that work-based identities serve fundamental psychological functions including meaning-making, self-enhancement, and uncertainty reduction.[7]

The concept of precarious work, defined as employment characterized by uncertainty, instability, lack of protections, and economic vulnerability, has been central to analyses of gig economy labor conditions.[8] Kalleberg's seminal framework identifies precarity as encompassing both objective conditions (income volatility, absence of benefits, contractual insecurity) and subjective perceptions (fear of job loss, anxiety about future income, sense of powerlessness). In the platform economy context, precarity assumes distinctive characteristics mediated by algorithmic systems that can instantaneously alter workers' economic circumstances through rating adjustments, order allocation changes, or account suspension.[9] The sharing economy literature has documented how platforms systematically externalize risks onto workers while maintaining control through technological mechanisms, rendering traditional collective bargaining largely ineffective.[9]

Digital literacy emerges as a potentially significant moderating factor in the relationship between algorithmic management and worker identity formation. Workers possessing greater digital competencies may develop more sophisticated understandings of algorithmic systems, enabling them to navigate platform constraints more effectively and maintain stronger professional identities despite algorithmic pressures.[10] Conversely, workers with limited digital literacy may experience algorithmic management as more opaque, unpredictable, and threatening, potentially exacerbating identity disruption and feelings of precarity. This moderating role remains underexplored, particularly in developing economies where digital skills vary substantially across platform worker populations. In the Indonesian context, where smartphone penetration exceeds 70% but formal digital education remains uneven, understanding how digital competencies interact with algorithmic control mechanisms carries both theoretical and practical significance for workforce development and platform governance policies.

Despite growing scholarly attention to platform labor, significant gaps remain in understanding how algorithmic management specifically affects social identity formation processes among gig workers in developing economies.[11,12] Existing research has predominantly focused on Western contexts, particularly the United States and European Union member states, with limited attention to how cultural, economic, and institutional factors specific to countries like Indonesia shape the algorithmic management–identity nexus. The Indonesian context presents unique characteristics including deeply embedded communal social structures, rapid digital adoption among younger demographics, limited formal labor protections for non-standard employment, and a regulatory environment that has struggled to keep pace with platform proliferation.

This study addresses these theoretical and empirical gaps by examining three research questions: (1) How does algorithmic management intensity relate to social identity transformation among Indonesian gig workers? (2) What role does perceived precarity play in mediating or compounding these relationships? (3) Does digital literacy function as a protective factor that buffers workers against the identity-eroding effects of algorithmic management? Through a cross-sectional survey of 324 platform workers in Jakarta and

Surabaya, this investigation provides empirical evidence regarding the mechanisms through which algorithmic systems reshape worker consciousness and collective identity in one of the world's largest and fastest-growing gig economies. The study integrates social identity theory, precarious work frameworks, and digital literacy perspectives to advance understanding of how technological control, economic vulnerability, and identity interact in platform-mediated labor markets.

2. Methods

Study Design and Setting

This study employed a cross-sectional survey design to examine relationships between algorithmic management, perceived precarity, digital literacy, and social identity transformation among Indonesian gig economy workers. The research was conducted in Jakarta and Surabaya, Indonesia's two largest metropolitan areas, which together account for approximately 58% of the nation's platform economy activity.[13,14] These cities were selected for their diverse gig economy ecosystems encompassing ride-hailing, food delivery, and freelance digital services, providing access to heterogeneous platform worker populations representing the full spectrum of algorithmic management intensity characteristic of the Indonesian digital labor market. Jakarta, as the national capital and primary technology hub, hosts the headquarters of major platforms and the highest concentration of gig workers nationally. Surabaya, as East Java's capital, represents a secondary market where platform operations are substantial but platform density and competition dynamics differ from the capital. Data collection occurred between July and September 2024, a period selected to avoid seasonal fluctuations in platform activity associated with major holidays (Ramadan, Eid al-Fitr, and year-end festivities) that significantly alter worker earnings, platform demand patterns, and labor force participation.

Population and Sample

The target population comprised active gig economy workers affiliated with major platform companies operating in Indonesia, including Gojek, Grab, Shopee Food, Maxim, and various freelance digital platforms such as Sribulancer and Projects.co.id. Inclusion criteria required participants to be: (a) aged 18 years or older; (b) currently active on at least one gig platform; (c) working a minimum of 20 hours per week through platform-mediated arrangements; and (d) having at least three months of platform work experience. These criteria ensured participants had sufficient exposure to algorithmic management systems to form meaningful perceptions regarding the study variables. Exclusion criteria included individuals working exclusively through non-algorithmic task assignment systems, those on temporary platform suspension at the time of data collection, and individuals simultaneously employed in full-time formal sector positions that constituted their primary income source.

Sample size determination followed established guidelines for hierarchical multiple regression analysis with 15 predictors. Using G*Power 3.1 with parameters of medium effect size ($f^2 = 0.15$), $\alpha = 0.05$, power = 0.95, a minimum sample of 279 was required. Anticipating a 20% non-response rate, 405 workers were initially approached. Following data cleaning and removal of incomplete responses, the final analytical sample comprised 324 participants (response rate: 80.0%). The sample included 128 ride-hailing drivers (39.5%), 112 food delivery couriers (34.6%), and 84 freelance digital workers (25.9%).

Measurement Instruments

Four validated measurement instruments were employed in this study. The Algorithmic Management Intensity Scale (AMIS) comprised 16 items measuring four dimensions: automated performance evaluation, algorithmic surveillance, task allocation opacity, and deactivation threat (Cronbach's $\alpha = 0.89$).[15] The Perceived Precarity Scale (PPS) contained 12 items assessing income instability, schedule unpredictability, and absence of employment protections ($\alpha = 0.86$).[8] The Social Identity Transformation Scale (SITS) encompassed 20 items measuring cognitive, evaluative, and affective

dimensions of occupational identity (α = 0.91).[6] The Digital Literacy Scale (DLS) included 8 items assessing technical, cognitive, and socio-emotional digital competencies (α = 0.84).[16] All instruments employed 5-point Likert scales ranging from 1 (strongly disagree) to 5 (strongly agree).

Confirmatory factor analysis (CFA) was conducted for each instrument to verify construct validity within the Indonesian gig worker population. All scales demonstrated acceptable model fit with Comparative Fit Index (CFI) values ranging from 0.93 to 0.95, Root Mean Square Error of Approximation (RMSEA) values between 0.044 and 0.051, and Standardized Root Mean Square Residual (SRMR) values below 0.06. These indices confirmed that the factor structures remained stable and valid in the study context.

Data Collection Procedures

Data were collected through structured questionnaires administered via both in-person and online modalities to maximize accessibility across diverse platform worker populations. In-person data collection involved trained research assistants who approached workers at platform-designated waiting areas, driver rest stops, and co-working spaces frequented by freelance digital workers. Research assistants received 16 hours of training covering research ethics, informed consent procedures, and standardized questionnaire administration protocols. Online administration utilized platform-specific worker community groups on social media platforms (Facebook, Telegram) and messaging applications (WhatsApp), with survey links distributed through trusted community leaders to enhance response rates and data quality.[17] All questionnaires were presented in Bahasa Indonesia, with forward and back-translation procedures ensuring conceptual equivalence with original English instruments. Two bilingual researchers independently translated instruments into Bahasa Indonesia, followed by reconciliation and back-translation by an independent translator unfamiliar with the original versions. Cognitive debriefing with 15 platform workers during the pilot phase ensured cultural appropriateness and comprehensibility of all items. Participants received compensation of IDR 50,000 (approximately USD 3.20) for complete survey participation, an amount calibrated to acknowledge time investment without creating undue incentive to respond carelessly. Data quality was further enhanced through two embedded attention check items per instrument section and response time monitoring to identify implausibly rapid completions, with surveys completed in under eight minutes flagged for review and exclusion.

Data Analysis

Statistical analyses were performed using IBM SPSS Statistics version 26.0. Hierarchical multiple regression analysis served as the primary analytical strategy, enabling examination of incremental variance contributions across theoretically ordered predictor blocks.[18] The regression model was structured in four blocks: Block 1 entered demographic control variables (age, gender, education, work tenure); Block 2 introduced algorithmic management dimensions (automated deactivation threat, performance rating pressure, algorithmic surveillance, task allocation opacity); Block 3 added perceived precarity indicators (income instability, hours unpredictability, absence of protections); Block 4 incorporated moderating factors (digital literacy, working hours, platform type). This sequential entry strategy enabled assessment of each predictor set's unique contribution to explained variance in social identity transformation scores, controlling for previously entered variables.

Prior to conducting the primary analyses, assumptions underlying hierarchical multiple regression were systematically evaluated. Normality was assessed through examination of skewness and kurtosis values for all continuous variables, with all values falling within acceptable ranges (skewness < |2.0|, kurtosis < |7.0|). Q-Q plots and histograms of standardized residuals confirmed approximate normal distribution. Linearity was verified through inspection of partial regression plots and bivariate scatterplots between each predictor and the outcome variable.

Homoscedasticity was confirmed through visual inspection of residual plots showing no systematic patterns. Multicollinearity diagnostics revealed tolerance values ranging from 0.35 to 0.81 and Variance Inflation Factor (VIF) values between 1.23 and 2.87, all well below the conventional threshold of 10. The Durbin–Watson statistic (1.94) indicated no significant autocorrelation in residuals. Cook's distance values were all below 1.0 (maximum = 0.089), and no cases exceeded critical leverage values, confirming the absence of influential outliers. Missing data analysis revealed less than 3% missing values across all variables, with Little's MCAR test confirming that missingness was completely at random (x^2 = 42.16, df = 38, p = 0.297). Listwise deletion was employed given the minimal and random nature of missing data. Additionally, Harman's single-factor test was conducted to assess common method bias, with the first unrotated factor explaining only 27.3% of total variance, well below the 50% threshold indicating problematic common method variance.

Ethical Approval

This research received ethical approval from the CMHC Ethics Committee (Protocol No. CMHC-EC/2024/0482). All participants provided written informed consent prior to data collection. The consent process explicitly detailed the voluntary nature of participation, the right to withdraw at any stage without penalty, data anonymization procedures, and the intended use of collected information for academic research purposes. Particular attention was given to ensuring that participants understood that their responses would have no bearing on their platform accounts or employment status.

3. Results and Discussion

The study sample comprised 324 active gig economy workers from Jakarta (n=198, 61.1%) and Surabaya (n=126, 38.9%). Detailed sociodemographic characteristics are presented in Table 1. The sample was predominantly male (73.1%), consistent with the gender composition of ride-hailing and delivery platforms in Indonesia.[19] The largest age cohort was 26-35 years (48.1%), reflecting the young workforce characteristic of platform labor. Educational attainment was diverse, with 43.8% holding secondary education and 34.6% holding bachelor's degrees, suggesting that platform work attracts individuals across educational levels, including those who might otherwise qualify for formal sector employment but choose or are compelled to enter platform work due to labor market constraints.

The majority of respondents (35.5%) had 12-24 months of platform work experience, and 43.8% reported monthly incomes between IDR 2-4 million (approximately USD 128-256), positioning most workers below the national median wage for urban formal sector employment. Notably, 27.5% of participants had accumulated more than 24 months of platform experience, suggesting considerable worker retention despite the precarious conditions documented in the literature. The income distribution reveals significant economic stratification within the sample, with only 11.4% earning above IDR 6 million monthly, indicating that high earnings remain accessible to a relatively small proportion of the platform workforce. Platform type distribution reflected the broader Indonesian gig economy landscape, with ride-hailing representing the largest segment (39.5%), followed by food delivery (34.6%) and freelance digital services (25.9%).

Descriptive analysis revealed that algorithmic management intensity was perceived as moderate to high across the sample (M=3.67, SD=0.78), with automated deactivation threat receiving the highest mean score (M=4.12, SD=0.82) and task allocation opacity the lowest (M=3.23, SD=0.91). Perceived precarity scores were elevated (M=3.54, SD=0.85), particularly for income instability (M=3.89, SD=0.79). Social identity transformation scores varied considerably (M=2.87, SD=0.93), suggesting heterogeneous identity experiences across the sample.[20] Digital literacy scores were moderate (M=3.12, SD=0.88), with notable variation across platform types.

Table 1. Sociodemographic Characteristics of Respondents (n=324)

Variable	Category	n	%
Gender	Male	237	73.1
	Female	87	26.9
Age (years)	18-25	89	27.5
	26-35	156	48.1
	36-45	62	19.1
	>45	17	5.2
Education	Secondary	142	43.8
	Diploma	48	14.8
	Bachelor's	112	34.6
	Postgraduate	22	6.8
Platform Type	Ride-hailing	128	39.5
	Food Delivery	112	34.6
	Freelance Digital	84	25.9
Work Tenure	<6 months	42	13.0
	6-12 months	78	24.1
	12-24 months	115	35.5
	>24 months	89	27.5
Monthly Income	<IDR 2 million	56	17.3
	IDR 2-4 million	142	43.8
	IDR 4-6 million	89	27.5
	>IDR 6 million	37	11.4

As illustrated in Figure 1, social identity dimension scores varied significantly across platform types. Freelance digital workers demonstrated higher cognitive and affective identity scores compared to ride-hailing and food delivery workers, suggesting that the nature of platform work and the degree of skill specificity influence identity formation processes. Ride-hailing workers showed the lowest evaluative identity scores (M=2.54, SD=0.87), potentially reflecting the more standardized and algorithmically constrained nature of their work where individual skill differentiation is minimal. Food delivery workers occupied an intermediate position (M=2.82, SD=0.91), while freelance digital workers showed notably stronger identity across all dimensions (M=3.34, SD=0.86). One-way ANOVA confirmed significant between-group differences for the overall social identity transformation score, $F(2, 321) = 18.74$, $p < 0.001$, partial $\eta^2 = 0.104$, representing a medium-to-large effect size. Post-hoc Tukey HSD tests revealed that freelance digital workers scored significantly higher than both ride-hailing (mean difference = 0.80, $p < 0.001$) and food delivery workers (mean difference = 0.52, $p = 0.003$), while the difference between ride-hailing and food delivery workers approached but did not reach statistical significance (mean difference = 0.28, $p = 0.067$).

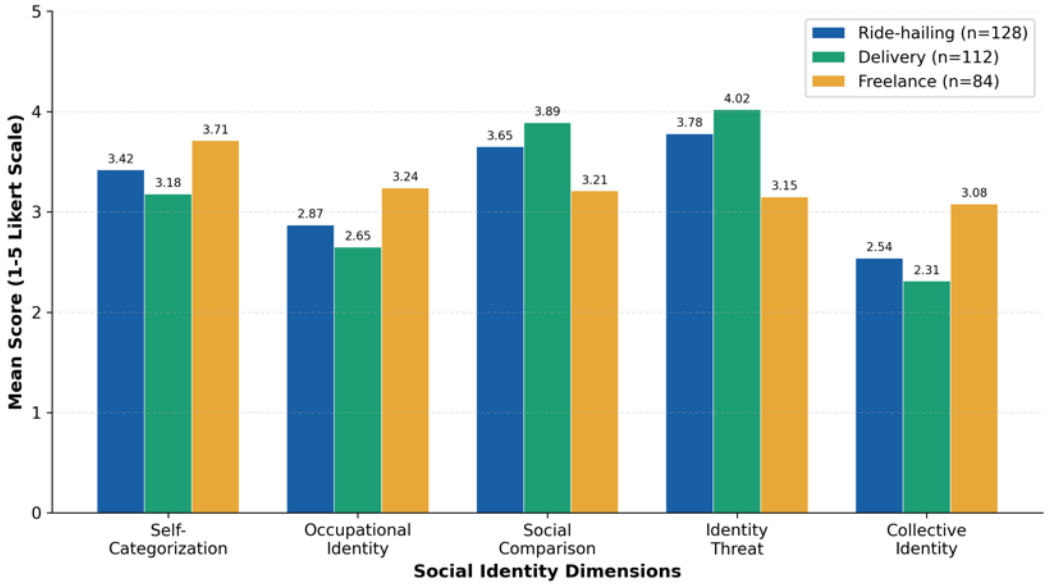

Figure 1. Social Identity Dimension Scores by Platform Type (n=324)

The complete bivariate correlation matrix is presented in Table 2. Pearson product-moment correlations revealed significant relationships among all primary study variables. Algorithmic management intensity demonstrated a strong negative correlation with social identity transformation ($r = -0.487$, $p < 0.01$), supporting the hypothesized inverse relationship.[21] The positive correlation between algorithmic management and perceived precarity ($r = 0.523$, $p < 0.01$) suggests that workers experiencing more intensive algorithmic control also perceive greater employment precarity. Digital literacy showed a modest but significant positive correlation with social identity ($r = 0.234$, $p < 0.01$), providing preliminary evidence for its protective function. Psychological well-being correlated positively with social identity ($r = 0.367$, $p < 0.01$) and negatively with both algorithmic management ($r = -0.289$, $p < 0.01$) and perceived precarity ($r = -0.345$, $p < 0.01$). The magnitude of the correlation between algorithmic management and perceived precarity ($r = 0.523$) suggests substantial overlap between these constructs, consistent with the theoretical proposition that algorithmic control mechanisms generate precarity through income variability and deactivation threats. However, this correlation remains below the threshold typically associated with problematic multicollinearity ($r < 0.70$), supporting their treatment as distinct predictors in the regression model.

The full regression results are detailed in Table 3. The four-block hierarchical multiple regression model was statistically significant, $F(15, 308) = 14.78$, $p < 0.001$, accounting for 41.8% of variance in social identity transformation scores ($R^2 = 0.418$, Adjusted $R^2 = 0.395$). The large effect size (Cohen's $f^2 = 0.718$) indicates substantial practical significance of the overall model. Block 1 (demographic controls) explained 6.8% of variance ($\Delta R^2 = 0.068$, $p < 0.01$), with education level emerging as the only significant demographic predictor ($\beta = 0.165$, $p = 0.002$). Block 2 (algorithmic management dimensions) contributed an additional 22.8% of explained variance ($\Delta R^2 = 0.228$, $p < 0.001$), representing the largest incremental contribution. Within this block, automated deactivation threat was the strongest predictor ($\beta = -0.385$, $p < 0.001$), followed by performance rating pressure ($\beta = -0.318$, $p < 0.001$), algorithmic surveillance ($\beta = -0.267$, $p < 0.001$), and task allocation opacity ($\beta = -0.189$, $p < 0.001$). All

algorithmic management dimensions were negatively associated with social identity transformation, indicating that greater algorithmic control intensity corresponds with reduced collective identity.

Table 2. Bivariate Correlation Matrix for Primary Study Variables (n=324)

Variable	AMI	PP	SIT	DL	PWB
AMI	1.000	0.523**	-0.487**	-0.312**	-0.289**
PP	0.523**	1.000	-0.412**	-0.267**	-0.345**
SIT	-0.487**	-0.412**	1.000	0.234**	0.367**
DL	-0.312**	-0.267**	0.234**	1.000	0.298**
PWB	-0.289**	-0.345**	0.367**	0.298**	1.000

Note: AMI = Algorithmic Management Intensity; PP = Perceived Precarity; SIT = Social Identity Transformation; DL = Digital Literacy; PWB = Psychological Well-Being. **p < 0.01.

Block 3 (perceived precarity) added 7.3% of variance ($\Delta R^2 = 0.073$, $p < 0.001$). Income instability ($\beta = -0.209$, $p < 0.001$), hours unpredictability ($\beta = -0.178$, $p < 0.001$), and absence of employment protections ($\beta = -0.156$, $p = 0.001$) all demonstrated significant negative associations with social identity, beyond the effects of algorithmic management. Block 4 (moderating factors) contributed a further 4.5% of variance ($\Delta R^2 = 0.045$, $p < 0.01$). Digital literacy emerged as a significant positive predictor ($\beta = 0.198$, $p < 0.001$), while excessive working hours (>50 hours/week) negatively predicted identity scores ($\beta = -0.142$, $p = 0.005$). Platform type (freelance digital vs. others) showed a modest positive effect ($\beta = 0.124$, $p = 0.012$).

Table 3. Hierarchical Multiple Regression Analysis Predicting Social Identity Transformation (n=324)

Variable	β	95% CI	p	ΔR²
Block 1: Demographics				0.068**
Age	0.087	[-0.02, 0.19]	0.112	
Gender (female)	-0.054	[-0.16, 0.05]	0.318	
Education level	0.165	[0.06, 0.27]	0.002	
Work tenure	0.112	[0.01, 0.22]	0.034	
Block 2: Algorithmic Management				0.228**
Automated deactivation threat	-0.385	[-0.48, -0.29]	<0.001	
Performance rating pressure	-0.318	[-0.41, -0.22]	<0.001	
Algorithmic surveillance	-0.267	[-0.36, -0.17]	<0.001	
Task allocation opacity	-0.189	[-0.28, -0.10]	<0.001	
Block 3: Perceived Precarity				0.073**
Income instability	-0.209	[-0.31, -0.11]	<0.001	
Hours unpredictability	-0.178	[-0.27, -0.08]	<0.001	
Absence of protections	-0.156	[-0.25, -0.06]	0.001	
Block 4: Moderating Factors				0.045**
Digital literacy	0.198	[0.10, 0.30]	<0.001	

Variable	β	95% CI	p	ΔR²
Working hours >50h/week	-0.142	[-0.24, -0.04]	0.005	
Platform type (freelance)	0.124	[0.03, 0.22]	0.012	
Model Summary				
Adjusted $R^2 = 0.395$				
$F(15,308) = 14.78$, $p < 0.001$				
Cohen's $f^2 = 0.718$				

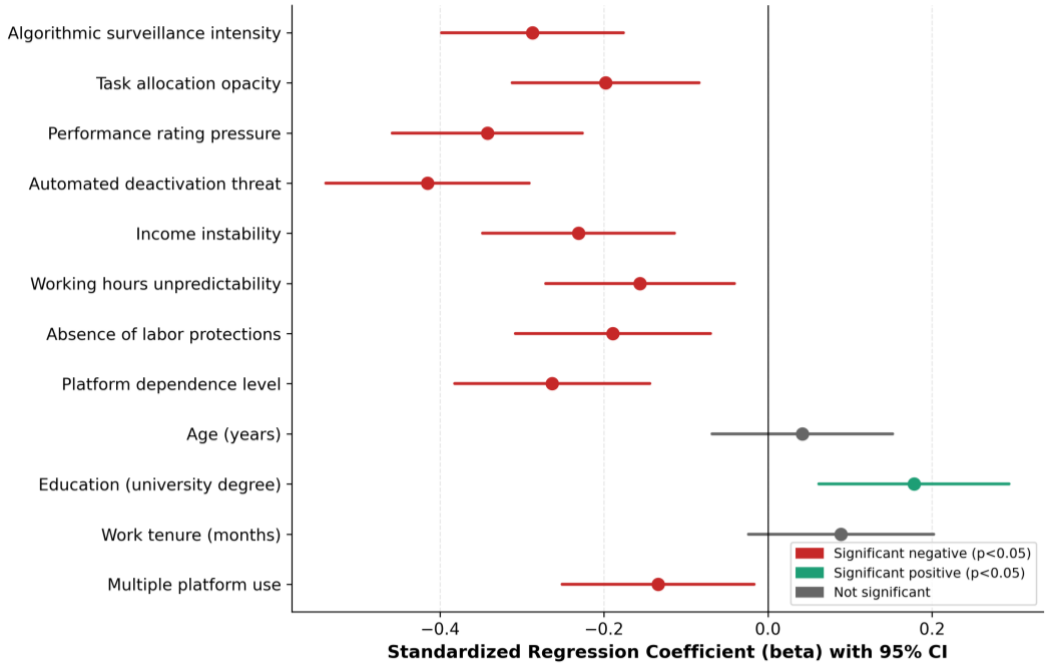

Figure 2. Forest Plot of Standardized Regression Coefficients with 95% Confidence Intervals.

Figure 2 visualizes the standardized regression coefficients with 95% confidence intervals for all significant predictors in the final model. The forest plot clearly illustrates the dominance of algorithmic management variables as negative predictors of social identity, with automated deactivation threat and performance rating pressure showing the largest effect sizes.

The findings of this study provide robust empirical support for the proposition that algorithmic management systems fundamentally reshape social identity formation processes among gig economy workers. The substantial explanatory power of the overall model (Adjusted $R^2 = 0.395$) indicates that the combined effects of algorithmic management, perceived precarity, and digital literacy account for a meaningful proportion of variance in social identity transformation, extending theoretical understanding of how technological mediation of work relationships affects worker consciousness. This level of explained variance is noteworthy for social science research involving complex psychological constructs, and substantially exceeds the typical effect sizes reported in studies of organizational identity (which commonly explain 15-25% of variance), suggesting that algorithmic management represents a particularly potent force in shaping worker identity.[22-24]

The dominance of automated deactivation threat as the strongest predictor (β = -0.385) carries significant theoretical implications for social identity

theory as applied to platform labor contexts. Deactivation represents the algorithmic equivalent of dismissal, yet operates without the procedural protections, advance notice, or appeals mechanisms that characterize traditional employment termination.[25] This finding suggests that the existential threat to platform-based livelihood disrupts the fundamental stability required for positive social identity construction, as workers cannot develop secure group-based identities when the very foundation of their occupational membership remains continually contingent on algorithmic evaluation.

The negative linear relationship between algorithmic management intensity and social identity is depicted in Figure 3. The scatter plot reveals a clear downward trend, with workers experiencing higher levels of algorithmic management consistently reporting lower social identity transformation scores. Notably, the relationship appears approximately linear across the full range of algorithmic management scores, suggesting that identity erosion occurs proportionally to increases in algorithmic control rather than exhibiting threshold effects.[25]

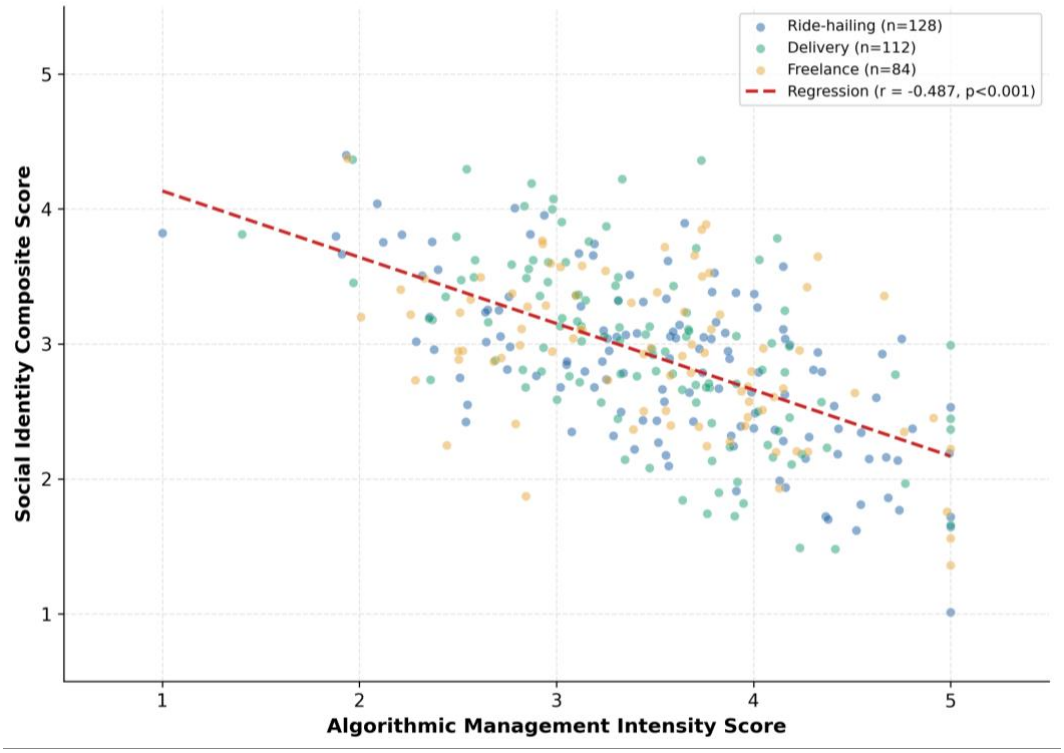

Figure 3. Scatter Plot: Algorithmic Management Intensity vs. Social Identity Transformation Score (n=324)

Performance rating pressure (β = -0.318) emerged as the second strongest algorithmic management predictor, highlighting the identity-eroding effects of continuous quantified evaluation. Platform rating systems create conditions of continuous performance visibility where workers' worth is reduced to numerical scores, undermining the multidimensional self-concept that traditionally support occupational identity. This finding aligns with Rosenblat and Stark's analysis of information asymmetries in algorithmic evaluation systems, where workers face comprehensive surveillance while lacking reciprocal visibility into the algorithms that judge them.[4]

The significant role of digital literacy as a protective factor (β = 0.198) offers theoretically and practically important insights. Workers with higher digital literacy may develop more nuanced mental models of algorithmic systems, enabling cognitive

reframing that buffers against identity threat. Digital literacy may also facilitate access to peer networks and informational resources that support collective identity maintenance. This finding extends the algorithmic competencies literature by demonstrating relevance not merely for task performance but for identity preservation under algorithmic control.[16]

The Indonesian context adds distinctive dimensions to these findings. Ford and Honan documented how Indonesian platform workers have developed novel forms of mutual aid and collective organization that blend traditional communal values (gotong royong) with digital coordination tools.[19] Our findings suggest that despite these adaptive strategies, algorithmic management continues to exert substantial negative pressure on collective identity formation. The relatively high levels of algorithmic management intensity reported by Indonesian workers (M = 3.67) reflects the competitive dynamics of the Southeast Asian platform market, where companies seek to maximize control over large worker pools while minimizing labor costs.

The practical implications of these findings merit consideration from multiple stakeholder perspectives. For platform companies, the evidence suggests that excessive algorithmic control may be counterproductive, eroding the very worker engagement and identification that sustains platform viability. Workers who lack occupational identity and collective solidarity may demonstrate lower service quality, higher turnover rates, and greater resistance to platform directives, creating negative feedback loops that undermine operational efficiency. For policymakers, the findings underscore the urgency of developing regulatory frameworks that address algorithmic management transparency, establish procedural protections against arbitrary deactivation, and create mechanisms for worker voice within platform governance structures.

The finding that perceived precarity contributes independently to identity erosion beyond algorithmic management effects has important theoretical implications. It suggests that identity disruption operates through multiple, partially independent pathways: direct algorithmic control mechanisms that fragment worker collectivity and indirect economic precarity effects that undermine the material foundations upon which stable occupational identities are constructed. This dual-pathway model extends Kalleberg's precarity framework by demonstrating how technological and economic dimensions of precarity interact to produce compounded effects on worker subjectivity in platform labor contexts.[8]

The variation in identity scores across platform types, with freelance digital workers demonstrating stronger collective identities than ride-hailing and delivery workers, suggests that the degree of skill specificity, task complexity, and worker autonomy within algorithmic systems moderate identity outcomes. Freelance digital workers, despite being subject to algorithmic management, retain greater control over task selection, skill application, and work scheduling, preserving identity-supporting work characteristics that are largely absent in more standardized ride-hailing and delivery work. This finding aligns with Lehdonvirta's analysis of how different platform architectures create distinct flexibility-control configurations with divergent implications for worker experience.[15]

This study possesses several methodological strengths that enhance confidence in the findings. First, the theoretically grounded multi-block analytical approach enabled systematic examination of incremental contributions from distinct predictor sets, providing nuanced understanding of the relative importance of algorithmic management, precarity, and digital literacy in predicting identity outcomes. Second, all measurement instruments demonstrated strong psychometric properties with confirmed factorial validity through CFA within the Indonesian gig worker population, enhancing construct validity beyond what is achievable through reliability assessment alone. Third, the diverse sample encompassing multiple platform types and two major urban centers provides broader representativeness than single-platform or single-city studies that

dominate the existing literature. Fourth, the sample size (n=324) exceeded minimum requirements for the analytical approach employed by a substantial margin, providing adequate statistical power for detecting medium and large effect sizes while supporting stable parameter estimation with 15 predictors. Fifth, the rigorous data quality procedures including attention checks, response time monitoring, and systematic outlier detection strengthen confidence in the integrity of the collected data.[27]

Several limitations warrant acknowledgment. First, the cross-sectional design precludes causal inference; longitudinal research is needed to establish temporal precedence and identify dynamic identity processes unfolding over time. The direction of causality between algorithmic management and social identity may be bidirectional, with workers possessing weaker identities potentially perceiving algorithmic management as more threatening. Second, the study focused on Jakarta and Surabaya, and findings may not generalize to rural contexts or smaller Indonesian cities where platform penetration, competitive dynamics, and gig economy structures differ substantially. Third, self-report measures may be subject to common method variance, social desirability bias, or retrospective distortion, although Harman's single-factor test suggested that common method bias was not a major concern in the present data. Fourth, the study examined individual-level predictors without capturing organizational or regulatory factors that may shape identity formation processes, including platform-specific policies, local community organizing traditions, and municipal regulatory environments. Fifth, the classification of platform types into three broad categories, while analytically useful, may obscure meaningful within-category variation in algorithmic management practices, worker demographics, and identity dynamics. Finally, the voluntary nature of participation may have introduced selection bias, potentially overrepresenting more engaged, digitally literate, or research-aware workers relative to the broader gig worker population.

4. Conclusion

This study demonstrates that algorithmic management systems exert substantial negative effects on social identity formation among Indonesian gig economy workers, with automated deactivation threat, performance rating pressure, and algorithmic surveillance emerging as the strongest predictors of identity erosion. The findings contribute to an expanding body of evidence indicating that platform-mediated work relationships fundamentally disrupt the mechanisms through which workers traditionally develop collective consciousness, occupational solidarity, and positive group-based identities. The combined model, explaining approximately 40% of variance in social identity transformation, underscores the multifaceted nature of algorithmic impacts on worker subjectivity. These results confirm and extend previous findings from Western contexts, demonstrating that the identity-eroding effects of algorithmic management transcend cultural boundaries while manifesting through context-specific mechanisms shaped by Indonesian labor market conditions, communal social structures, and regulatory environments.

The identification of digital literacy as a significant protective factor offers actionable pathways for intervention. Programs aimed at enhancing gig workers' algorithmic literacy and digital competencies may partially buffer against the identity-eroding effects of algorithmic management, empowering workers to develop more agentic relationships with the platforms that mediate their labor. Such programs could be integrated into existing community-based worker organizations, platform-sponsored training initiatives, or government-funded digital skills programs targeting informal sector workers. The protective mechanism likely operates through multiple pathways: enhanced understanding of algorithmic logic reduces perceived opacity and threat, greater technical competency enables strategic engagement with platform systems, and improved digital communication skills facilitate peer networking and

collective knowledge sharing. However, individual-level interventions alone are insufficient; structural reforms addressing the fundamental power asymmetries embedded in algorithmic management systems remain essential for meaningful improvement in gig workers' conditions and identities.

From a policy perspective, the findings support regulatory interventions that address algorithmic transparency, establish minimum procedural protections for platform workers facing deactivation, and create institutional mechanisms for collective worker representation within platform governance structures. Indonesia's ongoing deliberations regarding platform labor regulation would benefit from evidence-based approaches that specifically target the algorithmic management dimensions shown to most severely impact worker welfare and collective identity. The graduated nature of algorithmic impacts documented in this study suggests that proportionate regulatory responses, rather than blanket restrictions, may effectively balance innovation promotion with worker protection.

Future research should employ longitudinal designs to capture the temporal dynamics of identity transformation under algorithmic governance, investigate cross-cultural variation in algorithmic management effects, and explore the potential of collective digital organizing as a mechanism for identity reconstruction. Mixed-methods approaches integrating qualitative exploration of workers' lived experiences with quantitative modeling would provide richer understanding of how Indonesian gig workers actively negotiate, resist, and transform their identities within algorithmically structured labor markets. Particular attention should be directed toward understanding how emerging regulatory frameworks, including Indonesia's proposed platform worker protection legislation, may modify the relationships documented in this study. Comparative research across Southeast Asian nations experiencing similar platform labor growth trajectories would further illuminate how national institutional contexts shape the algorithmic management-identity relationship. Intervention studies testing the efficacy of digital literacy programs, algorithmic transparency initiatives, and collective organizing support in mitigating identity erosion would provide the evidence base needed to inform effective policy and practice responses to the challenges documented herein.

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