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Linking Algorithmic Management to Employee Innovation: Evidence from the Gig Economy †

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Abstract

The integration of AI technologies into management processes is rapidly shaping the digital era. The need to standardize operations and minimize human-related errors has made algorithmic management a strategic tool for contemporary organizations. Despite their importance and growing prevalence in today's dynamic business environment, employees' perceptions and attitudes towards these contemporary approaches remain unclear. Accordingly, the purpose of this cross-sectional study, drawing on Social Exchange Theory, is to investigate the direct effect of algorithmic management on innovative workplace behaviors and its indirect effects through organizational trust, trust in management, and algorithmic trust. Moreover, we tested the moderating effect of autonomy on the relationship between algorithmic management and innovative workplace behaviors. Data were collected from 450 gig-economy workers from the service industry in Istanbul. Data were analyzed in the R statistical environment. The findings demonstrated that all trust types, namely algorithmic trust, trust in management, and organizational trust, partially mediate the relationship between algorithmic management and innovative workplace behaviors. Additionally, we found that the relationship between algorithmic management and innovative workplace behaviors is stronger when employees' perceptions of autonomy are high. Taken together, the findings revealed that algorithmic management enhances innovative workplace behaviors through algorithmic trust when employees perceive high levels of autonomy. The study concludes by outlining managerial and further research directions, as well as limitations.

Keywords: algorithmic management; algorithmic trust; autonomy; innovative behaviors; organizational trust

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1. Introduction

The survival of businesses in the rapidly changing business world depends on their responses to change, their adaptation to it, and their ability to maintain a sustainable competitive advantage. From this perspective, especially when considered through general systems theory [1], it is impossible for organizations to remain independent of their surrounding ecosystem to sustain themselves. In this context, in the era of digital transformation and big data, it has become essential to address the inadequacies of traditional management practices and to integrate data-driven decision-making and strategy development. At this point, algorithmic management, "as using self-learning algorithms to make and execute labor-related managerial decisions—on individuals beyond producing economic value" [2], has taken its place in the business literature as one of these changes.

A literature review by Kadolkar et al. [3] revealed that algorithmic management has consequences such as employee performance, well-being (burnout, sleep deprivation), resistance (non-cooperation), pacifying the algorithm (silence), turnover intention [4], and collective organizing. Furthermore, it was revealed that processes such as working conditions, social relationships, and lack of community and autonomy are influential in determining these outcomes. Furthermore, there are also contextual variables such as social/ethical and institutional factors (Figure 1).

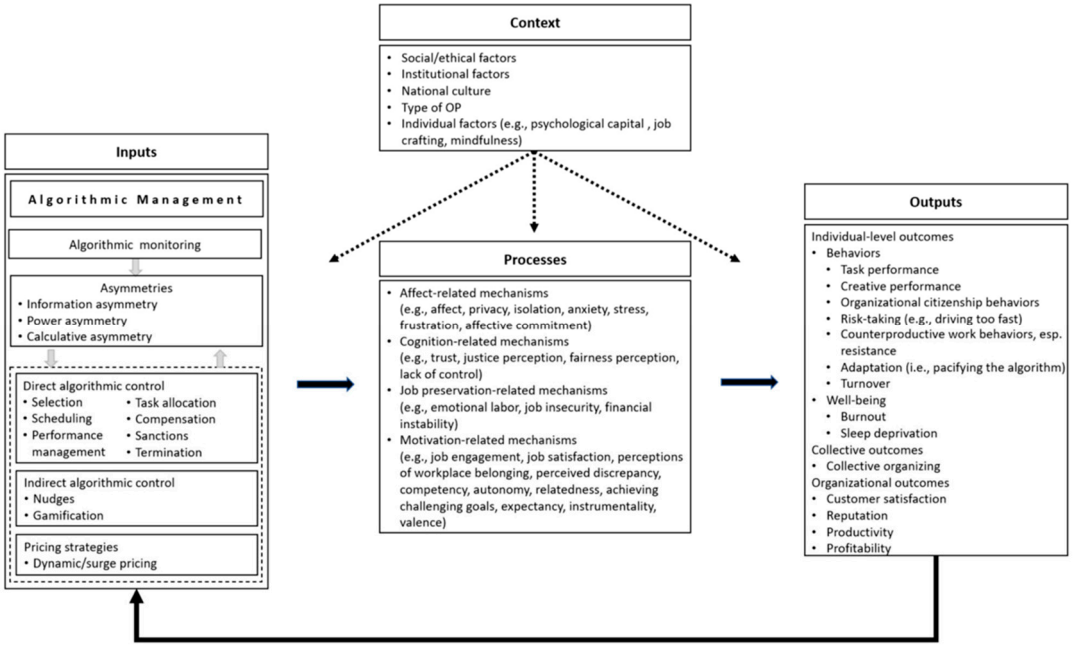


Figure 1. Antecedents and consequences of algorithmic management in the gig-economy (Source: [3]).

When the findings of the above study [3], which synthesizes numerous studies, are evaluated, it becomes clear that employees' trust in organizations that use algorithmic management practices, in managers, and in the algorithm itself is particularly important for researchers in organizational psychology. A comparative examination of the types of trust, a cognitive mechanism, extends this study beyond the literature. In this respect, identifying which types of trust influence employees' innovative behavior is crucial, especially for managers, practitioners, and policymakers.

Considering the above explanations, organizational trust is defined as "the willingness of one party to be vulnerable to the actions of another party based on the expectation that the latter will perform a particular action important to the trustor, irrespective of the ability to monitor or control that other party" [5]. On the other hand, trust in management refers to "employees' willingness to be vulnerable to the actions of their managers based on the belief that managers will act in ways that are beneficial or at least not detrimental to employees' interests" [6–8]. Finally, we defined trust in an algorithm as an employee's confidence in an algorithm's decision-making capabilities and quality, often demonstrated by a preference for algorithmic recommendations over human judgments.

Several systematic reviews reveal a relationship between trust, as a general concept, and many positive organizational outcomes, regardless of its type [9–15]. As shown by these studies, trust has many positive outcomes, including performance, organizational commitment, job satisfaction, organizational citizenship behaviors, knowledge collecting and donating, and innovative workplace behaviors [9,15–17]. Accordingly, innovative behaviors are defined as behaviors directed towards the initiation and application (within

a work role, group, or organization) of new and useful ideas, processes, products, or procedures [18–21].

By its very nature, algorithmic management (AM) is expected to foster employee innovation by institutionalizing innovation norms and prioritizing innovation-encouraging practices, thereby increasing it. More specifically, algorithmic management is predicted to be particularly effective when traditional leader-member relationships, defined as the quality of the relationship between employees and their leaders, are weak. This is because algorithmic management can compensate for limited human leadership behaviors by clearly outlining expectations for innovation and providing employees with feedback on these outcomes [22]. Considering these arguments, the following hypotheses were formulated:

H1. *Algorithmic management is positively associated with innovative workplace behaviors.*

H2. *Organizational trust mediates the positive relationship between algorithmic management and innovative workplace behaviors.*

H3. *Trust in management mediates the positive relationship between algorithmic management and innovative workplace behaviors.*

H4. *Algorithmic trust mediates the positive relationship between algorithmic management and innovative workplace behaviors.*

While there are studies in the literature on the positive effects of algorithmic management, several also suggest that its effects on organizational outcomes are not universally positive [23,24]. In other words, it can also lead to over-monitoring and reduced autonomy, which may undermine innovation if not counterbalanced by humanistic management practices [25,26]. Based on these findings, it was predicted that when employees have high levels of autonomy, they will be able to utilize their own skills and abilities, deviating from the norm, and exhibiting innovative workplace behaviors. Based on this understanding, the research hypothesis was developed as follows:

H5. *Autonomy moderates the positive relationship between algorithmic management and innovative workplace behaviors.*

The study's conceptual model, developed from the arguments, is presented in Figure 2.

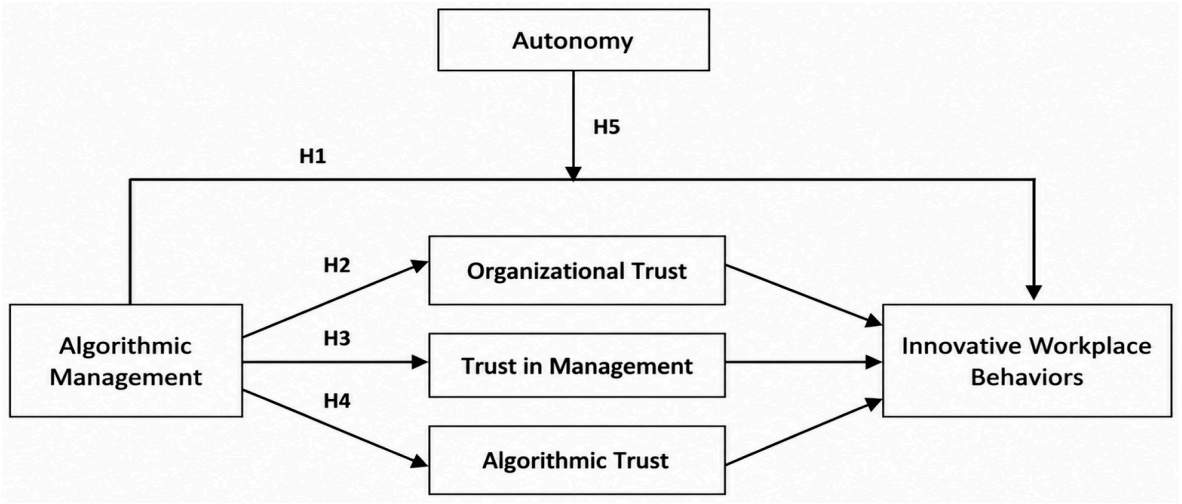


Figure 2. Conceptual model.

2. Methodology

The sample of this study consists of 450 gig-economy employees working in Istanbul, Türkiye. Employees were contacted using a convenience sampling method and asked to participate via social contacts. Within this scope, 600 employees were contacted and asked to participate in the survey. At the end of the two-month data collection process, 500 of the 600 surveys were returned (83% response rate). Of these, 17 were excluded from the study for reasons such as giving the same answer (9 respondents) and midpoint responding/straight lining (giving all answers a score of 3) (8 respondents). Of the remaining 483 surveys, 33 were considered outliers; after excluding them, the analyses proceeded with 450 valid surveys.

To collect data on the variables within the study's scope, valid and reliable measures were used. To measure the organizational trust, a 4-item scale developed by Huff and Kelly was used [27]. A sample item of this scale is "There is a very high level of trust throughout this organization." To measure trust in management, a 5-item trust-in-management scale [27–30] was used. A sample item of this scale is "I feel quite confident that my manager will always try to treat me fairly". Innovative workplace behaviors were measured with the 6-item scale [20]. A sample item of this scale is "I investigate and secure funds needed to implement new ideas". To measure algorithmic trust, we develop a 3-item scale ("I trust that the decisions made by algorithms are generally of high quality and accuracy", "When making a decision, I often find recommendations from algorithms more reliable than human judgment", "I have confidence in the ability of algorithms to evaluate complex situations"). Algorithmic management was measured using a 5-dimensional scale (monitoring, goal setting, scheduling, performance rating, compensation) consisting of 20 items [31]. Lastly, autonomy was measured by using a 4-item scale [32]. A sample item of this scale is "I have a lot of say over what happens on my job." All variables within the scope of the study were measured on a 5-point Likert scale (1—Strongly disagree, 5—Strongly agree).

Analyses were conducted by using the R statistical environment [33]. Specifically, the libraries used are as follows: "psych" [34], "GPArotation" [35], "lavaan" [36,37], "semTools" [38], "nFactors" [39].

To test construct validity, exploratory and confirmatory factor analyses were conducted. Accordingly, the factor loadings for the six-factor scale ranged from 0.65 to 0.88. The KMO value was 0.81, indicating that the sample size was appropriate for factor analysis [40]. Similarly, to conduct confirmatory factor analysis of the six-factor structure, the fit of the observed variables to the measurement model, the covariances among the latent variables, and the model's fit to the data were evaluated. As a result of these analyses, the model's fit indices indicated a good fit ($\chi^2/df = 2.85$; CFI = 0.93; GFI = 0.90; TLI = 0.94; RMSEA = 0.065) [23]. On the other hand, the reliability analysis for each scale indicated that all factors were high at the $\alpha = 0.70$ threshold [41], demonstrating that the measurement instruments had internal consistency. Accordingly, the reliability levels of the scales are as follows: algorithmic management ($\alpha = 0.77$), organizational trust ($\alpha = 0.85$), trust in management ($\alpha = 0.90$), trust in the algorithm ($\alpha = 0.88$), innovative workplace behaviors ($\alpha = 0.85$), and autonomy ($\alpha = 0.83$).

3. Results

Correlation analysis was conducted to examine the associations among algorithmic management, organizational trust, trust in management, trust in the algorithm, autonomy, and innovative workplace behaviors. Accordingly, algorithmic management was positively and significantly associated with organizational trust ($r = 0.46$, $p < 0.01$), trust in management ($r = 0.52$, $p < 0.01$), and trust in the algorithm ($r = 0.56$, $p < 0.01$). These

findings indicate that higher levels of algorithmic management are associated with stronger perceptions of trust in the algorithm, management, and organization, respectively.

Consistent with the theoretical framework, all three trust dimensions demonstrated statistically significant positive correlations with innovative workplace behaviors. Among them, trust in the algorithm exhibited the strongest relationship with innovative behaviors ($r = 0.44$, $p < 0.01$), followed by trust in management ($r = 0.41$, $p < 0.01$) and trust in the organization ($r = 0.39$, $p < 0.01$). This pattern suggests that employees who hold more favorable perceptions of trust—particularly toward the organization as a whole—are more likely to engage in innovative behaviors.

The correlation between algorithmic management and innovative workplace behaviors was positive and statistically significant ($r = 0.41$, $p > 0.05$). Also, there is a negligible, non-significant positive relationship between algorithmic management and autonomy ($r = 0.01$, $p > 0.01$), whereas autonomy shows a strong, statistically significant positive relationship with innovative workplace behaviors ($r = 0.57$, $p < 0.01$).

A mediation analysis using 5000 bootstrap samples showed that algorithmic management had a statistically significant indirect effect on innovative workplace behaviors through algorithmic trust, trust in management, and organizational trust ($p < 0.05$) [42]. More specifically, the relationship between algorithmic management and innovative workplace behaviors ($\beta = 0.41$, $p < 0.001$) does not lose its significance when the mediator variables namely trust in algorithm ($\beta = 0.24$, $p < 0.001$), trust in organization ($\beta = 0.29$, $p < 0.001$), and trust in management ($\beta = 0.27$, $p < 0.001$) are included, but it decreases significantly. In this context, the findings show that the trust variable plays an important role in translating algorithmic management into innovative workplace behaviors.

In addition to the above explanations, when the moderating effect of autonomy on the impact of algorithmic management on innovative workplace behaviors was tested, the findings revealed that the moderating effect was not statistically significant ($p > 0.05$).

Upon evaluation of the above results, the H1–H4 hypotheses were supported, but H5 was not.

4. Conclusions

Overall, the findings of this study indicate that algorithmic management directly stimulates innovative workplace behaviors among gig-economy workers; rather, its influence operates indirectly through trust-based mechanisms, namely organizational trust, algorithmic trust, and trust in management. Specifically, our results suggest that algorithmic systems foster innovation when employees perceive their organization, its algorithm, and management as trustworthy.

Our findings show that algorithmic management, which significantly increases innovative workplace behaviors that can provide a competitive advantage for organizations, is fueled by trust. In other words, in an organization where trust is absent, modern management, monitoring, and performance appraisal methods, such as algorithmic management, may have only a limited effect in achieving the expected increase in productivity. In this context, ensuring that the processes within the organization, the algorithms used, and the managers are open, transparent, and understandable will not only lead to employees exhibiting more positive behaviors but also, by instilling a greater tendency towards risk-taking, contribute to increased innovative behaviors. When evaluated from this perspective, our findings are consistent with studies in the literature arguing that algorithmic management is insufficient to produce positive results, contrary to popular belief [23–26]. Furthermore, autonomy did not strengthen the relationship between algorithmic management and innovative behaviors as predicted, implying that discretion in task execution does not, by itself, amplify the innovation-enhancing potential of algorithmic management.

Taken together, these results underscore that algorithmic management contributes to innovation primarily when embedded within a broader climate of organizational trust, and they point to the critical role of human-centered institutional support in enabling workers to convert algorithmic structures into innovative contributions.

As with many studies, this study has several limitations. First, its cross-sectional nature makes it insufficient to explain causal effects. Therefore, future researchers are recommended to conduct longitudinal studies to draw more causal explanations or inferences. Second, the study sample consisted of gig economy workers in Istanbul, Turkey. It is recommended that future researchers examine the differences between Turkey and other countries to generalize the results. Finally, the study examined variables focused on the bright side of algorithmic management. Future research focusing on the dark side, such as over-monitoring, opacity, and control [42,43], hindrance demands, low level of service quality, and demotivated referral behaviors [22], decreased workplace wellbeing, reduced autonomy, and total rewards [44], silence, and cynicism, will contribute to a holistic understanding of algorithmic management.

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