JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

ALGORITHMIC MANAGEMENT AND EMPLOYEE WELL-BEING IN PAKISTANI HIGHER EDUCATION INSTITUTIONS: THE MODERATING ROLE OF PSYCHOLOGICAL EMPOWERMENT

Sadia Anjum[*1], Dr. Sardar Ahmad[2], Faysal Namver[3], Saima Naz[4]

[*1]*Assistant Manager, Sustainable Development Initiative (SDI), Office of Participant Affairs University of Management and Technology & PhD Scholar, Lahore Leads University.*
[2]*HoD Business Studies Department, Lahore Leads University,*
[3]*Assistant Manager, State Life & PhD Scholar, Lahore Leads University.*
[4]*Deputy Superintendent, NADRA & PhD Scholar, Lahore Leads University.*

[*1]sadia.anjum@umt.edu.pk, [2]sardar_ahmad1@outlook.com, [3]faysalnamver99@gmail.com, [4]saima1naz1tarar@gmail.com

DOI: https://doi.org/10.5281/zenodo.23155678

Keywords
Algorithmic management, employee wellbeing, psychological empowerment, HEIs, PLS-SEM, Pakistan, Digital tracking system.

Article History
Received: *25 June 2026*
Accepted: *16 September 2026*
Published: *05 October 2026*

Copyright @Author
Corresponding Author: *
Sadia Anjum

Abstract

Algorithmic management has emerged as a vital tool for reforming efficiency and monitoring performance with the increasing adoption of digital technologies in organizational management. Although algorithmic management systems offer operational benefits, their impact on employee well-being remains under explored, especially in academic institutions of developing countries. This study empirically examines the impact of algorithmic management on well-being of workers in Pakistani HEIs, evaluating the moderating role of psychological empowerment. By employing quantitative research design, the study collected data from 800 administrative and academic staff of 14 private and 18 public higher educational institutions using structured questionnaire. PLS-SEM (Partial Least Squares Structural Equation Modeling was applied following outlier analysis, data screening and CMB (Common-Method-Bias Assessment).The measurement model was examined through Cronbach's alpha, CR (Composite Reliability), Indicator Loadings, AVE (Average Variance Extracted), and HTMT (Heterotrait-Monotrait) ratio. Using bootstrapping (5000 resamples) and path coefficients Q^2, R^2 and F^2 the study assessed structural model. Moderation analysis evaluated cushioning role of psychological empowerment. The results depict that algorithmic management has a significant negative effect on employees' well-being while psychological empowerment significantly weakens the negative relationship between employees' well-being and algorithmic management. Algorithmic management control systems have less effect on the employees who have high psychological empowerment. The study provides empirical evidence from a

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

developing-country higher-education context and offers practical implications for designing technologically advanced yet employee-centered workplaces.

1. INTRODUCTION

Rapid trends of digitalization in institutions have globally changed traditional administrative procedures across organizations. Technological advancement at the edge of the 4th industrial revolution (Tao *et al.*, 2021) is leading to gigantic transformation across every facet of society (Su *et al.*, 2020). It has also captivated the focus of many scholars (Tambe *et al.*, 2019; Kellogg *et al.*, 2020; Park *et al.*, 2021; Minbaeva, 2020; Cascio & Montealegre, 2016). Algorithmic management is one of the emerging trends also impacting organizational structures (Horvath & Szabo, 2019; Parent-Rocheleau & Parker, 2022). Data-driven and digitalization systems mean the employ of algorithm-based systems for the delegation of managerial tasks in organizations such as task allocation, performance tracking and feedback. This allows institutions to utilize artificial intelligence, self-learning analytical applications, software algorithms and automated decision-making systems (Mann & O'Neil, 2016) to monitor employees' behavior, simultaneously learn, assign tasks, solve problems and make performance-related decisions in complicated domains (Lee *et al.*, 2015; Lee, 2018). These algorithmic-driven systems create new opportunities for businesses (Newman *et al.*, 2020) and now automate managerial practices that previously were the responsibilities of the managerial workforce (Tomprou & Lee, 2022) with effective data-driven decision making. It is observed that such systems reduce unconscious human bias with accurate outcomes and analysis in complicated domains (Cheng & Hackett, 2019). These data-driven decision-making systems outperform human managerial practices in more than 80% of cases in normal work environments (Yu *et al.*, 2017). On one hand they increase organizational effectiveness; on the other hand, they create anxiety and stress for the workforce (Gal *et al.*, 2020; Rosenblat & Stark, 2016; Tambe *et al.*, 2019), ultimately affecting employee wellbeing (Angrave *et al.*, 2016). Rapid digitalization affects workers' wellbeing, work tasks and motivation (Kinowska & Sienkiewicz, 2023; Parker & Grote, 2022; Smith & Carayon, 1995). Psychological wellbeing depends on competence and autonomy that enable the workforce to put full potential into work tasks (Deci & Ryan, 2000). Previous research shows that for highly skilled jobs, feeling of control on work and job automation are negatively correlated (Holford, 2020).

Task execution is defined as the worker's attitude and potential to accomplish organizational targets that are affected by the worker's strategy to accomplish those tasks (Maslach *et al.*, 2001). Employees' positive task performance and wellbeing are positively correlated with psychological empowerment at the workplace (Xanthopoulou *et al.*, 2009; Bakker & Albrecht, 2018). Psychological empowerment is a motivational force based on four intellectual dimensions: impact, free-will, meaning and competence (Spreitzer, 1995). Management support with psychological empowerment acts as a moderating role in balancing the association between work automation and employee wellbeing (Juyumaya, 2022).

Algorithmic management has been widely explored in gig-economy platforms like Uber and FoodPanda but its impact on professional and institutional work environments, specifically in developing countries, remains underexplored (Rosenblat & Stark, 2016; Kellogg *et al.*, 2020; Jabagi *et al.*, 2019; Rockmann & Ballinger, 2019). In Pakistan, Higher Education Institutions (HEIs) are rapidly moving towards digitalization and data-driven systems for both academic and administrative purposes. Algorithmic systems such as Learning Management Systems (LMS),

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

biometric attendance, automated performance tracking, and digital KPI monitoring are vivid examples of this technological advancement (Qureshi, 2021). These systems enhance operational performance and efficiency but also create unintended psychological pressure and stress, affecting employee well-being. Existing literature suggests that highly monitored work environments may increase stress, reduce autonomy and contribute to discouragement (Möhlmann & Zalmanson, 2017).

The trend of data-driven systems and algorithmic management is increasing in Higher Education Institutions (HEIs) but its impact on the wellbeing of academic and administrative staff, directly or indirectly, remains under explored, especially with the alleviating effect of psychological empowerment. The main focus of existing research is gig-economy workers in European and Western countries, leaving a research gap concerning the effect of algorithmic management on the wellbeing of employees in developing countries (Lee *et al.*, 2015; Kinowska & Sienkiewicz, 2023; Rosenblat & Stark, 2016). Moreover, organizational factors such as psychological empowerment that may mitigate the negative effects of data-driven systems on employees' wellbeing have not received much attention in the Pakistani context. Employees' wellbeing that comprises emotional, psychological and job-related health is considered vital for employees' active participation, retention, organizational productivity and efficiency (Diener, 2000). Therefore, if algorithmic management has a negative relationship with well-being at the workplace, it may increase turnover, stress, reduce job satisfaction and diminish organizational performance (Bakker & Demerouti, 2007). In this context, evaluating the moderating role of employees' perception of competence, autonomy, meaning and impact—collectively called psychological empowerment—is crucial (Spreitzer, 1995; Juyumaya, 2022).

This study is significant as it extends the literature related to algorithmic management and effects of rapid digitalization to the higher education sector in a developing country such as Pakistan, providing a context-specific comprehension of its impact on employees' well-being. The insights will help public and private universities' administrators and policymakers in Pakistan to design data-driven management systems that increase institutional efficiency without compromising the mental health of the workforce. Findings will assist university administrations and the Higher Education Commission (HEC) to design strategies that improve task efficiency and empower employees in the era of digital governance without affecting their wellbeing.

The primary focus of the present investigation is to assess the empirical effect of algorithmic management on employees' wellbeing in Pakistani higher educational institutions; to test the direct relationship of psychological empowerment with employees' wellbeing; and to analyze the moderating role of psychological empowerment in the association between employees' wellbeing and algorithmic management.

2. Theoretical Background

This section critically reviews the existing literature related to employee wellbeing, algorithmic management and psychological empowerment to establish the theoretical foundation and identify the gaps that justify the present study.

2.1 Algorithmic Management

2.1.1 Evolution and Concept

An algorithm is a computational formula based on statistical models that autonomously tracks performance, efficiency and makes decisions without managerial involvement (Duggan *et al.*, 2020; Eurofound, 2018). Algorithmic management means the delegation and transferring of human managerial functions to digitalized systems driven by algorithms and data analytics (Kellogg *et al.*, 2020). These systems perform managerial performance-tracking tasks previously executed by managers—monitoring

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal
ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

performance, allocating task assignments, providing feedback, and examining organizational efficiency (Lee *et al.,* 2015). This concept emerged from studies of gig-economy dynamics such as FoodPanda and Uber platforms, where staff are tracked entirely through algorithmic systems (Rosenblat & Stark, 2016; Veen *et al.,* 2020). The trend of digitalization and use of algorithmic systems is increasing in traditional sectors too, including finance, manufacturing, and higher education. Digitalized management includes performance tracking, task allocation, feedback, automated evaluation and digital surveillance mechanisms (Parent-Rocheleau & Parker, 2022). Digital management has a positive effect on tracking performance and organizational efficiency (Tomprou & Lee, 2022; Lee, 2018) but existing studies show that it has more negative than positive effects on workers' wellbeing (Parent-Rocheleau & Parker, 2022). Therefore, increased use of algorithmic management is associated with risks and challenges (Veen *et al.,* 2020) and is negatively related to employee wellbeing (Parent-Rocheleau & Parker, 2022; Kinowska & Sienkiewicz, 2023; Kellogg *et al.,* 2020).

2.1.2 Algorithmic Control and Job Autonomy

One of the major debates in algorithmic management research revolves around job independence. Job independence is the level of autonomy and freedom according to which an employee can plan and perform work tasks (Hackman & Oldham, 1975). Research shows that high degrees of worker control are related to lower degrees of anxiety and psychological distress (Terry & Jimmieson, 1999). Autonomy has universal importance in promoting psychological health and human motivation (Vansteenkiste & Ryan, 2013; Sheldon & Niemiec, 2006; Deci & Ryan, 2000; Deci *et al.,* 2001; Chatzisarantis *et al.,* 2012). While digital structures can improve effectiveness and transparency, they may also reduce perceived autonomy and increase feelings of surveillance (Möhlmann & Zalmanson, 2017). Constant monitoring can create stress, increase emotional exhaustion and reduce employee motivation (Rosenblat & Stark, 2016). The influence of algorithmic and digitalized management is dependent on psychological and contextual factors and may not always be negative.

2.1.3 Algorithmic Management in Higher Education

In academic and administrative domains of higher education institutions, data-driven tools and algorithmic systems such as biometric attendance, digital grading systems, automated performance tracking and Learning Management Systems (LMS) are increasingly common. Despite their increasing presence, empirical research on employee wellbeing and algorithmic management within academic and administrative domains of educational institutions, especially in developing countries like Pakistan, remains scarce. In Pakistan, educational institutions are undergoing rapid automation and digital transformation, yet little empirical research exists on how these systems psychologically affect the workers of these institutions. This research gap provides a strong justification for the current study.

2.2 Employee Well-Being

The COVID-19 pandemic created high interest in employees' wellbeing (Bakker & van Wingerden, 2020) and it is now counted as one of the priorities of top management (Deloitte, 2020). Employee wellbeing refers to the degree of freedom, autonomy, emotional, psychological and cognitive state of the workforce in the work environment (Warr, 1990). It comprises workplace health, job satisfaction, engagement and motivation (Diener, 2000). Well-being is vital for institutional sustainability because it affects turnover rate, productivity, commitment and creativity of workers (Bakker & Demerouti, 2007). Psychological wellbeing is most important (Johnson *et al.,* 2018). Management is directly related to workplace health and wellbeing; it is the responsibility of management to provide employees all necessary tools including job

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

security, autonomy, job satisfaction and psychological empowerment (Robertson, 2016).

2.3 Psychological Empowerment

Psychological empowerment is the employees' motivation based on four cognitions: sovereignty, outcome, capability and sense (Spreitzer, 1995). These dimensions are defined as (i) capability—the confidence in the worker's ability to accomplish tasks; (ii) meaning—the alignment between personal values and job role; (iii) impact—the belief that one's actions influence performance; and (iv) self-determination—the sense of job autonomy. Psychological empowerment enhances job satisfaction and motivation (Thomas & Velthouse, 1990; Iqbal et al., 2025) and is positively related to employee wellbeing (Juyumaya, 2022). It also reduces burnout syndrome and increases spiritual strength (Beuren, 2021), consequently improving task performance (Koopmans *et al.,* 2013).

2.4 Hypotheses Development and Theoretical Framework

This section develops the theoretical base and hypotheses of the study. The theoretical foundation incorporates two renowned theories: Self-Determination Theory and the Job Demands-Resources (JD-R) model.

2.4.1 Job Demands–Resources (JD-R) Model

The Job Demands–Resources (JD-R) model defines that the balance between job requirements and job assets shapes workers' wellbeing (Bakker & Demerouti, 2007). Job requirements are the psychological, cultural, social or institutional elements of the workplace that require sustained effort. In this research, algorithmic management constitutes a job demand characterized by continuous performance tracking, digital monitoring and data-driven evaluation. Such systems may reduce motivation, increase performance pressure and heighten perceptions of surveillance (Kellogg et al., 2020). Job resources promote target attainment, diminish job requirements and facilitate individual growth. Psychological empowerment is defined as a job resource that enables employees to fulfil digitally intensified job demands. Low resources combined with high job demands lead to diminished well-being and stress, while high levels of resources reduce the negative effects of workplace demands.

2.4.2 Self-Determination Theory (SDT)

Self-Determination Theory (SDT) relates to the satisfaction and motivation associated with three fundamental psychological needs: relatedness, sovereignty and capability (Deci & Ryan, 2000). Employees experience greater workplace involvement, wellbeing and psychological empowerment when these basic needs are fulfilled; otherwise stress and discouragement increase. Algorithmic management diminishes sovereignty and limits decision-making power. When employees are psychologically empowered, the negative effects of stress are moderated. Therefore, SDT identifies the psychological domains through which empowerment moderates the effects of data-driven systems.

2.4.3 Algorithmic Management and Employee Wellbeing

Algorithmic management automates the performance tracking of employees (Kellogg et al., 2020; Kinowska & Sienkiewicz, 2023). Research shows that these systems can create burden, reduce autonomy and increase psychological stress (Rosenblat & Stark, 2016). In higher education institutions of Pakistan, digitalization, biometric attendance and continuous performance tracking may heighten stress and pressure. As per the JD-R model, increasing digital monitoring increases job demands and diminishes well-being (Bakker & Demerouti, 2007). Empirical studies show that algorithmic management is negatively linked to employee wellbeing (Möhlmann & Zalmanson, 2017).

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

H1: Algorithmic and digitalized management has a notable and negative influence on employees' wellbeing in Pakistani HEIs.

2.4.4 Psychological Empowerment and Employee Wellbeing

Psychological empowerment is a motivational push comprising capability, sovereignty, sense and outcome (Spreitzer, 1995; Juyumaya, 2022). Empirically, psychological empowerment is positively linked to job fulfillment and wellbeing (Seibert *et al.,* 2011). From an SDT perspective, it fulfills the needs of competence and autonomy.

H2: Psychological empowerment has a notable and positive influence on employee wellbeing in Pakistani higher education institutions.

2.4.5 Moderating Role of Psychological Empowerment

The JD-R model suggests that job resources diminish the negative influence of job demands. When workers are equipped with psychological empowerment, the negative influence of job demands diminishes. Empowered employees consider digital tracking systems as performance-enhancing tools rather than threats to autonomy. When psychological empowerment is elevated, the negative link between algorithmic management and wellbeing should diminish.

H3: Psychological empowerment intervenes the link between algorithmic management and employees' wellbeing such that the negative influence of algorithmic management on worker wellbeing is weaker at higher levels of psychological empowerment.

2.5 Conceptual Framework

Figure 1 depicts the conceptual framework of the study. Algorithmic management exercises direct negative impact on employees' wellbeing (H1). Psychological empowerment exerts direct positive impact on employees' wellbeing (H2) and weakens the relationship between employees' wellbeing and algorithmic management (H3). The framework is based on Self-Determination Theory and JD-R model.

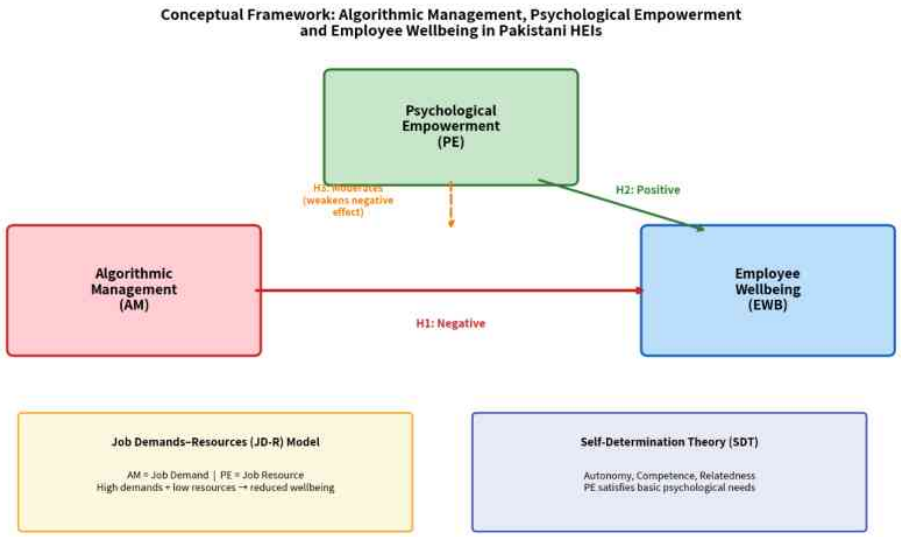


Figure 1: Conceptual framework linking employees' wellbeing, algorithmic management and psychological empowerment

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

3. Research Methodology

The study uses a structured cross-section survey design to examine the relationship between employees' wellbeing and algorithmic management in HEIs of Pakistan, while evaluating the moderating role of psychological empowerment. Quantitative empirical research is appropriate for this study as it allows evaluation of relationships between variables using advanced statistical techniques and large datasets. The analytical strategy of this research follows a comprehensive PLS-SEM (Partial Least Squares Structural Equation Modeling) approach, which is particularly suitable for complex models involving non-normal data distributions, predictive research goals and moderation commonly found in research related to social science domain (Hair *et al.*, 2019; Hair *et al.*, 2021). The research model comprises: Independent Variable – Algorithmic Management; Dependent Variable – Employee Well-Being; Moderating Variable – Psychological Empowerment.

3.1 Population and Sample

The population comprises academic and administrative staff working in public and private higher educational institutions in Pakistan. Pakistan has more than 240 HEC-recognized higher educational institutions employing thousands of staff who interact daily with digital monitoring systems. Due to the large population size and geographical diversification, stratified random sampling was employed. A minimum sample size of 200–500 participants is considered suitable for PLS-SEM (Hair *et al.*, 2019). Primary data were collected through a structured questionnaire both online (Google Forms and email) and in-person from academic and administrative staff of 14 private and 18 public institutions. A total of 1,000 questionnaires were distributed; 850 were returned and 800 valid responses were retained after screening.

3.2 Measurement of Variables

All constructs were measured on a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Algorithmic management was measured with six adapted items from Kellogg *et al.* (2020) and Kinowska & Sienkiewicz (2023). Employee wellbeing was measured with eight items adapted from Diener *et al.* (2018). Psychological empowerment was measured with the 12-item Spreitzer (1995) scale as used by Juyumaya (2022).

Table 3.2 shows the adopted construct items of the study.

Table 3.2: Study Constructs

Construct	Statement	Adopted from
	Algorithmic Management (AM)	
AM1	My work performance is closely monitored through digital systems.	*Kellogg et al., 2020; Kinowska and Sienkiewicz, 2023*
AM2	Automated systems are used to evaluate my tasks and outcomes.	
AM3	I frequently receive feedback generated by performance algorithms.	
AM4	My daily tasks are assigned or prioritized based on data-driven systems.	
AM5	I feel that digital monitoring limits my autonomy in completing work.	
AM6	Algorithmic decision-making impacts important aspects of my job.	
	Employees' Wellbeing (EWB)	
EWB1	I feel satisfied with my job.	

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

EWB2	My work allows me to maintain a healthy work-life balance.	
EWB3	I feel motivated and engaged in my daily tasks.	
EWB4	I generally feel positive and content at work.	
EWB5	I feel stressed due to organizational work demands.	*Diener et al., 2018*
EWB6	I have opportunities to grow and develop professionally.	
EWB7	My job provides me with a sense of accomplishment.	
EWB8	I feel supported by my organization in managing work pressures.	
	Psychological Empowerment (PE)	
PE1	My work is useful to me.	
PE2	I am self-assured about my capability to perform my job well.	
PE3	I have independence in deciding how to perform my tasks.	
PE4	I feel that my contributions can influence outcomes at my workplace.	
PE5	I can make important decisions related to my work.	
PE6	I feel capable of handling my job responsibilities effectively.	*Spreitzer, 1995*; *Juyumaya, 2022*
PE7	I feel a clear motive in my work.	
PE8	My input is valued in organizational decisions.	
PE9	I have control over how I complete my work tasks.	
PE10	I can produce a fruitful difference at work.	
PE11	My skills match the requirements of my job.	
PE12	I feel a strong perception of possession over my work outcomes.	

Data Analysis Techniques and Analytical Strategy

Using SPSS and SmartPLS4, data analysis was conducted in a sequential multi-stage process. The following steps are undertaken: (i) Data screening to check completeness and quality of the 800 responses. (ii) Outlier analysis to identify and treat unrepresentative observations. (iii) Descriptive statistics (means, standard deviations, skewness and kurtosis) to examine distributional properties. (iv) Common Method Bias (CMB) assessment using Harman's single-factor test and full collinearity VIFs. (v) PLS-SEM as the main analytical technique to test the measurement and structural models. (vi) Measurement model assessment: indicator loadings, Cronbach's alpha, Composite Reliability (CR), Average Variance Extracted (AVE) and Heterotrait-Monotrait (HTMT) ratio. (vii) Confirmatory Factor Analysis (CFA) logic embedded in the measurement model evaluation. (viii) Variance Inflation Factor (VIF) to examine multicollinearity. (ix) Structural model assessment: path coefficients, R^2, f^2 effect sizes and Q^2 predictive relevance. (x) Bootstrapping (5,000 resamples) to obtain bias-corrected confidence intervals and significance levels. (xi) Moderation analysis to test the buffering role of psychological empowerment (product-indicator approach).

4. Empirical Results

This section elaborates the results following multi-stage PLS-SEM analytical strategy. The study distributed a total of 1000 questionnaires, received 850 responses and 800 valid responses were used in the study after outlier treatment and data screening.

4.1 Outlier Analysis and Data Screening

Table 4.1 presents the results. Data screening results supports that all retained 800 responses were complete on core constructs.

Table 4.1: Data Screening and Outlier Analysis

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Screening Step	Result / Decision
Initial valid responses	850
Univariate outliers ($z > 3.29$)	None critical
Multivariate outliers (Mahalanobis $p < 0.001$)	50 cases removed
Final sample size	800
Missing data pattern	None
Conclusion	Data quality satisfactory for PLS-SEM

By employing standardized *z*-scores ($z > 3.29$) univariate outliers were assessed while multivariate outliers were evaluated using Mahalanobis distance ($p < 0.001$). 50 cases were identified as multivariate outliers and removed, retaining a final sample of 800 responses. No missing data pattern was found.

4.2 Demographic Statistics

Table 4.2 shows the results of demographic statistics.

Table 4.2: Demographics

Variable	Category	Frequency	Percentage
Gender	Male	480	60%
	Female	320	40%
Age	25–35 years	310	39%
	36–45 years	320	40%
	Above 45 years	170	21%
Institution Type	Public	18	56%
	Private	14	44%
Work Experience	1–5 years	300	38%
	6–10 years	350	44%
	Above 10 years	150	18%

The results shows that high responses were obtained from male (480 responses, 60%) while 320 responses (40%) were received from female administrative and academic staff. 320 responses (40%) were received from age group 36-45 years, then 310 responses (39%) from 25-35 age bracket and 170 responses (21%) from above 45 age group. Study captured 14 (44%) private and 18 (56%) public universities. 350 responses (44%) were from academic and administrative staff who has work experience of 6-10 years, 300 responses (38%) from 1-5 years and 150 responses (18%) from above 10 years of work experience work group.

4.3 Descriptive Statistics

Table 4.3 shows the results of descriptive statistics. All means values are above scale midpoint, moderate S.D and skewness/ kurtosis falls within acceptable range of ±2 (Hair *et al.,* 2019).

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Table 4.3: Descriptive Statistics

Variable	Mean	SD	Skewness	Kurtosis	Min–Max
Algorithmic Management	3.47	0.77	-0.22	-0.39	1.00–5.00
Employee Well-Being	3.63	0.80	-0.35	-0.27	1.17–5.00
Psychological Empowerment	3.74	0.66	-0.19	-0.46	1.50–5.00

These descriptive patterns are consistent with Kinowska and Sienkiewicz, (2023) and Parent-Rocheleau and Parker, (2022).

4.4 Common Method Bias (CMB) Assessment

Table 4.4 and 4.4a depicts the results. Harman's single-factor test extracted a first factor explaining 31.4% of total variance which is below 50% threshold. Variance Inflation Factor (VIF) is below 3.3 acceptable range for three constructs, showing no multicollinearity problem. The results show no serious CBM concern (Podsakoff *et al.,* 2003; Kock, 2015; Hair *et al.,* 2021).

Table 4.4: Harman's Single-Factor Test

Particulars	Result
Method used	Exploratory Factor Analysis (Unrotated)
Number of factors extracted	1 (forced)
Variance explained by the first factor	31.4%
Recommended threshold	Less than 50%
Decision	No serious Common Method Bias

Table: 4.4a: VIF

Construct	Full Collinearity VIF
Algorithmic Management	1.88
Psychological Empowerment	1.94
Employee Well-Being	2.06

4.5 Measurement Model Assessment

The measurement model was examined for internal consistency reliability, indicator reliability, discriminant and convergent validity following Hair *et al.* (2019, 2021).

4.5.1 Indicator Loadings, Cronbach's Alpha, CR and AVE

Table 4.5.1 shows that all indicator loading exceeds the threshold of 0.70. Composite reliability and Cronbach's alpha values are greater than 0.70 while AVE values exceed the threshold of 0.50, confirming internal consistency, indicator reliability and convergent validity.

Table 4.5.1: Measurement Model

Construct	Items	Loadings range	α	CR	AVE
AM	6	0.73–0.85	0.88	0.90	0.63
PE	12	0.71–0.87	0.92	0.93	0.57
EWB	8	0.70–0.84	0.89	0.91	0.58

The results are consistent with Hair *et al.* (2019); Juyumaya, (2022); Kinowska and Sienkiewicz, (2023).

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

4.5.2 Discriminant Validity

Table 4.5.2 shows that Heterotrait-Monotrait ratios are below 0.85 threshold confirming discriminant validity (Henseler *et al.*, 2015; Hair *et al.*, 2021).

Table 4.5.2: HTMT Discriminant Validity Matrix

Construct	AM	PE	EWB
AM	–		
PE	0.40	–	
EWB	0.47	0.61	–

Structural Model Assessment

After establishing satisfactory measurement model, the study evaluated the structural model.

4.6.1 Path Coefficients and Hypothesis Testing

Table 4.6.1 shows the results of path coefficients. Algorithmic management has significant negative impact on employees' wellbeing with $\beta = -0.30$, $t = 6.86$, $p < 0.001$, supporting H1. Psychological empowerment has significant positive impact on employees' wellbeing with $\beta = 0.46$, $t = 11.23$, $p < 0.001$, supporting H2. The moderating term AM x PE is significant and negative with $\beta = -0.17$, $t = 4.55$, $p < 0.001$, supporting H3 that psychological empowerment weakens the effect of algorithmic management on employees' wellbeing.

Table 4.6.1: Structural Path Coefficient (Bootstrapping 5,000)

Path	β	t-value	p-value	95% CI	Decision
AM → EWB (H1)	–0.30	6.86	<0.001	[–0.40, –0.22]	Supported
PE → EWB (H2)	0.46	11.23	<0.001	[0.39, 0.55]	Supported
AM × PE → EWB (H3)	–0.17	4.55	<0.001	[–0.26, –0.10]	Supported

The results of negative impact of algorithmic management on employees' wellbeing are consistent with Kellogg *et al.* (2020), Kinowska and Sienkiewicz (2023) and Parent-Rocheleau and Parker (2022). The results of positive impact of psychological empowerment are consistent with Spreitzer (1995), Seibert *et al.* (2011) and Juyumaya (2022). Results of moderating effect are consistent with Bakker and Demerouti, (2007).

4.6.2 Coefficient of Determination (R^2), Effect Size (f^2) and Predictive Relevance (Q^2)

Table 4.6.2 shows the results of R^2, F^2 and Q^2.

Table 4.6.2: Coefficient of Determination, Effect Size and Predictive Relevance

Endogenous Construct / Predictor	R^2 / f^2	Q^2	Interpretation
EWB (R^2)	0.49	0.27	Moderate
AM → EWB (f^2)	0.11	–	Small–medium
PE → EWB (f^2)	0.27	–	Medium
AM × PE → EWB (f^2)	0.07	–	Small

The results show 49% variance in employees' wellbeing ($R^2 = 0.49$), presenting moderate explanatory power (Hair et al., 2019).Effect size f^2 shows medium effect of PE ($f^2 = 0.27$) and small to medium effect of AM and the moderating term. Q^2 values are greater than zero confirming predictive relevance. The results are consistent with Hair *et al.* (2019); Parent-Rocheleau and Parker, (2022).

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

5. Conclusion, Implications, Limitations and Recommendations

5.1 Conclusion

The purpose of the present study was to evaluate the influence of algorithmic management on employees' wellbeing and to examine the moderating role of psychological empowerment among academic and administrative staff of Pakistani HEIs. By employing PLS-SEM technique on 800 responses, the results depict that algorithmic management has a significant negative impact on employees' wellbeing, psychological empowerment has positive impact on employees' wellbeing while moderating the relationship between algorithmic management and employees' wellbeing. The results are consistent with Kellogg *et al.* (2020), Kinowska and Sienkiewicz (2023), Spreitzer (1995), Juyumaya (2022) following the thworetical foundation of Self-Determination Theory and JD-R model.

5.2.1 Theoretical Implications

This study extends algorithmic-management research beyond gig-economy platforms into the higher-education sector of a developing country. It integrates algorithmic management with psychological empowerment theory and provides strong empirical evidence for the moderating role of empowerment in a digitally intensifying work environment.

5.2.2 Practical Implications

University leaders and the Higher Education Commission should design algorithmic systems that preserve employee autonomy and provide meaningful feedback. Training programs that enhance psychological empowerment (competence, meaning, self-determination and impact) can buffer the wellbeing costs of digital monitoring. A balanced approach combining technological efficiency with human-centered management is recommended.

5.3 Limitations

The study is limited to HEIs in Pakistan, relies on self-reported cross-sectional data, and examines only one moderator. Future research should incorporate additional resources (e.g., leadership style, digital literacy) and employ longitudinal or multi-source designs.

5.4 Recommendations for Future Research

Future studies should examine algorithmic management in other Pakistani sectors (banking, healthcare, manufacturing), incorporate additional mediators or moderators, and conduct comparative research across developed and developing countries. Qualitative approaches can provide deeper insight into how academic staff experience algorithmic control.

REFERENCES

Angrave, D., Charlwood, A., Kirkpatrick, I., Lawrence, M. and Stuart, M. (2016). HR and Analytics: why HR is set to fail the big data challenge. Human Resource Management Journal, 26(1), 1-11.

Bakker, A. B., & Demerouti, E. (2007). The Job Demands–Resources model: State of the art. Journal of Managerial Psychology, 22(3), 309–328.

Bakker, A. B., and Albrecht, S. (2018). Work engagement: current trends. Career Development International, 23, 4–11.

Bilal, A., Ahmad, W., Jan, M. F., Huseynov, R., & Nagy, H. (2025). How women's transformational leadership induces employees' innovative behaviour through trust and connectivity: A sequential mediation model. *Global Business Review*, *26*(1), 240-255.

Cascio, W.F. and Montealegre, R. (2016). How technology is changing work and organizations. Annual Review of Organizational Psychology and Organizational Behavior, 3, 349-375.

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and self-determination of behavior. Psychological Inquiry, 11(4), 227–268.

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. American Psychologist, 55(1), 34–43.

Diener, E., Oishi, S., & Tay, L. (2018). Advances in subjective well-being research. Nature Human Behaviour, 2(4), 253–260.

Duggan, J., Sherman, U., Carbery, R. and McDonnell, A. (2020). Algorithmic management and app-work in the gig economy: a research agenda for employment relations and HRM. Human Resource Management Journal, 30(1), 114-132.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage Learning.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43(1), 115–135.

Hassan, S., Jan, M. F., & Hassan, M. (2026). PERCEIVED TRANSPARENCY AND SUSTAINABLE UNBOXING EXPERIENCES AS DRIVERS OF BRAND AUTHENTICITY IN EMERGING MARKETS. *Policy Journal of Social Science Review*, *4*(3), 390-399.

Jan, M. F., Imran, A., Mazhar, U., Batool, B., Noor, A., Malik, S., ... & Ullah, A. (2026). Impact of Student Learning Strategies on Academic Development and Psychological Well-Being among Children with Autism Spectrum Disorder. *International Journal of Special Education*, *41*(7s), 458-473.

Jan, M. F., Khan, I., Kamal, A., & Khan, P. (2026). The impact of corporate social responsibility (CSR) initiatives on employee attraction and retention. *Advance Journal of Econometrics and Finance*, *4*(2), 1-7.

Jan, M. F., Khan, T., Khan, P., & Zeb, F. (2026). Buffering the dark side of leadership: The role of green human resource management practices in mitigating exploitative leadership and fostering employee green innovative behavior. *Policy Journal of Social Science Review*, *4*(1), 144-155.

Jan, M. F. (2018). The effect of big five personality traits on leader member exchange and organization citizenship behavior: A case of khyber Pakhtunkhwa universities.[Yayınlanmamış Doktora Tezi]. *Tokat Gaziosmanpaşa Üniversitesi, Sosyal Bilimler Enstitüsü, İşletme Anabilim Dalı, Yönetim ve Organizasyon Bilim Dalı, Tokat*.

Juyumaya, J. (2022). How psychological empowerment impacts task performance: The mediation role of work engagement and moderating role of age. Frontiers in Psychology, 13.

Kellogg, K. C., Valentine, M., & Christin, A. (2020). Algorithms at work: The new contested terrain of control. Academy of Management Annals, 14(1), 366–410.

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Khan, M. A., Latif, W. B., Khattak, S. A., Marwat, A., Imran, A., & Jan, M. F. (2026). The green spark: how green HRM ignites employee innovation through organisational commitment. Future Business Journal, 12(1), 306.

Kinowska, K. and Sienkiewicz, L.J. (2023). Influence of algorithmic practices on workplace wellbeing – evidence from European organizations. Information Technology and People, 36(8), 21-42.

Kock, N. (2015). Common method bias in PLS-SEM: A full collinearity assessment approach. International Journal of e-Collaboration, 11(4), 1–10.

Lee, M. K., Kusbit, D., Metsky, E., & Dabbish, L. (2015). Working with machines: The impact of algorithmic and data-driven management on human workers. Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems, 1603–1612.

Möhlmann, M., & Zalmanson, L. (2017). Hands on the wheel: Navigating algorithmic management and gig work. Academy of Management Perspectives, 31(3), 275–292.

Nagy, H., Sana, S., Ahmad, W., Huseynov, R., Jan, M. F., & Bielik, P. (2021). Factors affecting fast food restaurant image in Peshawar: Moderating role of customer personality traits. *AGRIS on-line Papers in Economics and Informatics*, *13*(1), 105-119.

Parent-Rocheleau, X. and Parker, S.K. (2022). Algorithms as work designers: how algorithmic management influences the design of jobs. Human Resource Management Review, 32.

Podsakoff, P. M., MacKenzie, S. B., Lee, J. Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: A critical review of the literature and recommended remedies. Journal of Applied Psychology, 88(5), 879–903.

Qureshi, S. (2021). Digital governance and higher education in Pakistan: Challenges and opportunities. Journal of Educational Administration, 59(5), 567–582.

Rahman, S., Khan, T., Jan, M. F., & Zeb, F. (2026). Expanding the TQM Customer Satisfaction Model: The Role of Leadership and External Factors in Pakistan's Public and Private Hospitals. *Policy Journal of Social Science Review*, *4*(2), 351-365.

Sahibzada, Y. A., Ali, M., Toru, N., Farooq Jan, M., & Ellahi, A. (2025). Exploitative leadership and green innovative behavior of hospitality employees: mediation of emotional exhaustion and moderation of perceived organization support. *Journal of Hospitality and Tourism Insights*, *8*(5), 1847-1866.

Seibert, S. E., Wang, G., & Courtright, S. H. (2011). Antecedents and consequences of psychological empowerment: A meta-analytic review. Journal of Applied Psychology, 96(5), 981–1003.

Shah, M. U., & Jan, M. F. (2021). Connecting corporate social responsibility (CSR) to customer loyalty: A mediation analysis in hoteling industry of Pakistan. *Sage Open*, *11*(4), 21582440211067233.

Spreitzer, G. M. (1995). Psychological empowerment in the workplace: Dimensions, measurement, and validation. Academy of Management Journal, 38(5), 1442–1465.

Tomprou, M. and Lee, M.K. (2022). Employment relationships in algorithmic management: a psychological contract perspective. Computers in Human Behavior, 126.

Waleed, A., Ahmad, W., Jan, M., Ali, S., Khattak, A., & Nadeem, A. (2021). The effect of team value diversity on team performance: The mediating role of relationship conflict and the moderating effects of organization citizenship behavior and leader-member exchange

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

quality. *Management Science Letters*, *11*(8), 2185-2194.

Appendix A

Questionnaire for the Study

Title of the Study:
Algorithmic Management and Employees' Wellbeing in Pakistani HEIs: The Moderating Role of Psychological Empowerment

Instructions for Respondents:
Please indicate your level of agreement with the following statements by selecting the appropriate number from 1 to 5, where:

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree.

Section 1: Demographic Information

Item	Options
Gender	Male / Female
Age	25–35 / 36–45 / Above 45
Position	Faculty / Administrative Staff
Work Experience	1–5 years / 6–10 years / Above 10 years
Type of Institution	Public / Private

Section 2: Algorithmic Management
(Adapted from Kellogg et al., 2020; Kinowska & Sienkiewicz, 2023)

Item	Statement
AM1	My work performance is closely monitored through digital systems.
AM2	Automated systems are used to evaluate my tasks and outcomes.
AM3	I frequently receive feedback generated by performance algorithms.
AM4	My daily tasks are assigned or prioritized based on data-driven systems.
AM5	I feel that digital monitoring limits my autonomy in completing work.
AM6	Algorithmic decision-making impacts important aspects of my job.

Section 3: Employee Well-Being
(Adapted from Diener et al., 2018)

Item	Statement
EWB1	I feel satisfied with my job.
EWB2	My work allows me to maintain a healthy work-life balance.
EWB3	I feel motivated and engaged in my daily tasks.
EWB4	I generally feel positive and content at work.
EWB5	I feel stressed due to organizational work demands. *(Reverse-coded)*
EWB6	I have opportunities to grow and develop professionally.
EWB7	My job provides me with a sense of accomplishment.
EWB8	I feel supported by my organization in managing work pressures.

JOURNAL FOR SOCIAL SCIENCE STUDIES
An International Peer-Reviewed Open Access Journal

ISSN (Online): 3006-2071 | ISSN (Print): 3006-2063
Volume 4 • Issue 6 • October 2026

Section 4: Psychological Empowerment
(Adapted from Spreitzer, 1995; Juyumaya, 2022)

Item	Statement	Dimension
PE1	My work is useful to me.	Sense
PE2	I am self-assured about my capability to perform my job well.	Capability
PE3	I have independence in deciding how to perform my tasks.	Sovereignty
PE4	I feel that my contributions can influence outcomes at my workplace.	Outcome
PE5	I can make important decisions related to my work.	Sovereignty
PE6	I feel capable of handling my job responsibilities effectively.	Capability
PE7	I feel a clear motive in my work.	Sense
PE8	My input is valued in organizational decisions.	Outcome
PE9	I have control over how I complete my work tasks.	Sovereignty
PE10	I can produce a fruitful difference at work.	Outcome
PE11	My skills match the requirements of my job.	Capability
PE12	I feel a strong perception of possession over my work outcomes.	Sense / Outcome