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| RESEARCH ARTICLE

The Impact of Algorithm Management on Employee Job Satisfaction: Exploring the Mediating Role of Job Autonomy and the Moderating Effect of Employee Attitude: A Case Study on Two Premier Universitas Muhammadiyah (UMS and UMY)

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| ABSTRACT
This study delves into the intricate relationships among algorithm management, job autonomy, employee attitudes, and job satisfaction in the higher education landscape of Universitas Muhammadiyyah in Indonesia (UMS and UMY). Employing a quantitative methodology with a sizable sample of 550 individuals, comprising 250 respondents, and data collection encompassed surveys and interviews, yielding 215 responses. Ensuring the reliability of survey tools through test-retest and Cronbach's alpha analysis utilized Microsoft Excel, SPSS, and Smart PLS. Key hypotheses were tested, highlighting the positive impact of algorithm management on job autonomy. Additionally, the study explored job autonomy's positive effect on employee job satisfaction and its mediating role in the relationship between algorithm management and Job satisfaction. Employee attitudes were scrutinized as moderators of these relationships, and their positive influence on job satisfaction was established. The findings reveal the significant implications of algorithm management on both job autonomy and job satisfaction. Job autonomy was found to empower employees, leading to increased satisfaction and reduced stress, and employee attitude has no connection between algorithms management and job satisfaction. Therefore, these findings illuminate the intricate interplay between algorithm management, job autonomy, employee attitudes, and job satisfaction in the context of higher education.

| KEYWORDS

Algorithm management, job autonomy, employee job satisfaction, employee attitude.

| ARTICLE INFORMATION

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1. Introduction

Employee job satisfaction is a fundamental pillar in achieving organizational success, exerting influence on productivity, employee retention rates, and overall harmony within the workplace (Wolor et al., 2023). Job satisfaction is the result of evaluating one's job positively, influenced by personal needs and values, shaping perceptions of the work environment. It hinges on individuals' assessments of the factors they consider important in their job (Sempane et al., 2002). Job satisfaction reflects employees' attitudes and behaviors toward work, which is crucial for business success, especially with white-collar workers who are more productive and loyal and take fewer absences. Employers benefit from implementing strategies to boost employee satisfaction enhancing workplace morale and productivity(Javed et al., 2014). Businesses are increasingly adopting algorithms to streamline operations and enhance decision-making in the tech-driven environment. However, concerns arise about the impact on employee well-being and job satisfaction amid this shift toward algorithm-centric management (Gomathi & Rajini, 2019). As organizations integrate algorithms into their management practices, considerations of how these technological advancements impact the autonomy that employees have in their roles and their attitudes that define a positive work experience become crucial(Lee, 2018). Job autonomy,

freedom to make decisions, and employee attitudes, such as Employee Engagement, Job Involvement, Morale and Organizational Commitment, are integral aspects to be addressed to ensure a harmonious integration of algorithms in the workplace, fostering both efficiency and employee satisfaction(Kurtz, 2002).

Universitas Muhammadiyyah (Muhammadiyyah University) is a well-known higher education institution in Indonesia that operates under the Muhammadiyyah organization, one of Indonesia's largest Islamic social and educational movements. This university system comprises 172 universities(Walisongo, 2019). However, this research focuses on two prominent universities within the Muhammadiyah network: Universitas Muhammadiyyah Surakarta (UMS) and Universitas Muhammadiyyah Yogyakarta (UMY). Universitas Muhammadiyyah and its prominent universities, Universitas Muhammadiyyah Surakarta (UMS) and Universitas Muhammadiyyah Yogyakarta (UMY) reveal the intricate connections between algorithm management, job autonomy, and employee job satisfaction within the higher education landscape(Schor et al., 2020).

Algorithms are crucial in university decision-making, enhancing efficiency and resource allocation, notably in ensuring a fair and transparent student admissions selection process and optimizing course scheduling for resource utilization(Kusuma, 2010). Job autonomy is prevalent among faculty and administrative staff, granting educators independence in course design and research, while administrators have autonomy in policy and process management. (Little, 1990). The nexus between job autonomy and employee job satisfaction is crucial, as well as fostering a positive work culture, recognizing achievements, and providing opportunities for professional development (Chiniara & Bentein, 2016). In essence, the effective orchestration of algorithm management coupled with a balanced approach to job autonomy and employee satisfaction underscores the success and positive standing of these institutions in the realm of higher education(Allioui & Mourdi, 2023). This study explored the intricate relationship between algorithm management and employee job satisfaction. It places particular emphasis on investigating how job autonomy serves as a mediating factor in this relationship and how the influence of employee attitudes operates as a moderating variable.

2. Literature Review

The integration of autonomous manufacturing techniques driven by intelligent robots emphasizes safety, adaptability, flexibility, and collaboration, presenting cost-effective and efficient solutions across industries(Potgieter et al., 2019). These advanced robotic systems, continuously evolving with technological advancements, contribute to the industrial revolution by expanding beyond traditional tasks and work environments(Liu, 2023). Research explores the relationship between algorithm management and job satisfaction through surveys and statistical analyses, investigating the impact of algorithm practices on employee satisfaction(Pantouvakis et al., 2023). Additionally, studies delve into the mediating role of job autonomy, examining how it influences the relationship between algorithm management and job satisfaction, with considerations for employee attitudes such as Organizational Commitment, Employee Engagement, Morale, and Job Involvement(W. R. Lee et al., 2021). Through statistically grounded analyses, these studies aim to provide insights into the complex dynamics between algorithm management, job satisfaction, and employee attitudes(Faigen et al., 2021)

2.1 Algorithm management

Algorithms, systematic rules for problem-solving or calculations, have long been integral to business practices, as highlighted by Max Weber's characterization of methodical decision-making within bureaucracies(Wood, 2021). Algorithmic management, defined as self-learning algorithms handling labor-related decisions, automates tasks traditionally managed by humans, shifting toward more automated and autonomous processes(Parent-Rocheleau & Parker, 2022; Singh et al., 2016). It involves using algorithms to manage various aspects of the workforce, including hiring, work coordination, and performance monitoring, based on data collected from employees and stakeholders(Mateescu & Nguyen, 2019). With technology advancements, particularly in digitalization and artificial intelligence, algorithmic management is reshaping HR practices, offering efficiency and precision in decision-making(Baiocco et al., 2022). However, its implications remain uncertain, with debates over its potential benefits in enhancing efficiency and coordination versus concerns about accuracy and scalability(Gagné et al., 2022; Benlian et al., 2022). The increasing adoption of algorithms across industries underscores the importance of understanding their impact on employees, organizations, and society(Kinowska & Sienkiewicz, 2020).

2.2 Job satisfaction.

Job satisfaction refers to employees' feelings regarding their work(Azadeh et al., 2011; Alfaleh et al., 2021). It also signifies the extent to which individuals have a positive or negative attitude toward their jobs and the features of their tasks. Job satisfaction as the pleasurable or positive emotional state that arises from evaluating one's job or job-related experiences(Kaol, 2017; Alfaleh et al., 2021). Job satisfaction is a complex concept encompassing emotional and cognitive dimensions, reflecting individuals' feelings, thoughts, and intentions towards their work(Fujimoto et al., 1981). It signifies the extent to which employees enjoy or dislike their jobs, playing a critical role in determining work effectiveness(Omar et al., 2017; Fida & Najam, 2019). Job satisfaction theory posits that it's fundamentally an attitude shaped by the balance of positive and negative emotions experienced in the workplace(Al Shbail

et al., 2022). Factors influencing job satisfaction include the work environment, responsibilities, compensation, growth opportunities, and the fit between an employee and their job(Hora et al., 2018). Algorithmic management and job autonomy can also impact job satisfaction by affecting aspects like task allocation, decision-making authority, and perceived fairness in algorithm use(Alfaleh et al., 2021).

2.3 Job autonomy.

Job autonomy refers to the degree to which employees have control and discretion over the tasks they perform and how they perform them. Autonomy as "the degree to which the individual has control over the content and timing of his work(Li & Tuckey, 2023; Maloney, 2021). Job autonomy, a crucial aspect of organizational dynamics, encompasses various dimensions such as job schedule, work procedures, and work criteria selection, granting employees control over their tasks and methods(Khoshnaw & Alavi, 2020; Chua & Ayoko, 2021). It aligns with structural empowerment, providing workers with decision-making authority and access to resources(Lin et al., 2013; Goussinsky, 2023). Job autonomy serves as a motivating factor, influencing employees' intrinsic work motivation, satisfaction, and performance quality(Jennifer Anne Haley, 2001; Tran et al., 2021). It plays a vital role in the job demand-control model, affecting worker health and well-being by offering a sense of volition and choice(Rodríguez et al., 2016; Tabiu, 2019). While autonomy fosters motivation and well-being, excessive autonomy can lead to disengagement and productivity issues(Alfaleh et al., 2021; Mockaitis et al., 2022). Striking a balance is essential to leverage the benefits of autonomy while addressing its potential drawbacks(Li & Tuckey, 2023; Waschull et al., 2020).

2.4. Employee attitudes

Employee attitude encompasses individuals' feelings towards various aspects of their work environment. In other words, it's the assessment or personal interests concerning work-related subjects. From these explanations, it can be inferred that employee attitude entails an individual's inclination towards both positive and negative aspects of their work environment(Shahab & Nisa, 2014). Consequently, a person is more likely to engage in a particular job if they possess a positive attitude towards it. Individuals aim to reconcile conflicting attitudes and ensure that their attitudes and behaviors are rational and coherent. When inconsistencies arise, mechanisms are activated to restore equilibrium and align the individual's attitudes and behaviors(K et al., 2018). He identified several factors that affect attitudes toward work, including personality, person-environment fit, job characteristics, psychological contract, organizational justice, work relationships, and stress. These factors are often cited as influencing how individuals perceive and approach their work roles(Susanty et al., 2013). Job attitudes are reflections of an individual's assessment of their job, encompassing their emotional responses, beliefs, and sense of connection to their work. This definition considers both the cognitive and emotional aspects of these evaluations, acknowledging that these components may not always perfectly align(Judge & Kammeyer-Mueller, 2012). Freemantle (2002) emphasizes the significance of positive employee attitudes for any business. He suggests that with empathetic and respectful treatment, even customers who display unreasonable behavior and place extreme pressure on frontline staff can become more cooperative. Therefore, empowering employees to work autonomously becomes essential(Scheers & Botha, 2014).

2.5 Theoretical framework

2.5.1 The technological determinism theory

The term "technological determinism" is frequently used as a critical label to dismiss certain types of theoretical and empirical assertions. However, it can be a valuable and significant perspective when seen as emphasizing the independent and society-shaping aspects of technology. It clarifies debates surrounding technological determinism by examining the concept of technology, and it dissects the array of claims associated with technological determinism(Dafoe, 2015). The concept of technological determinism frequently emerges in discussions related to shifts in the economy and employment, particularly in the context of the 'fourth industrial revolution.' fundamental labor process analysis offers the best basis for an alternative comprehension of the connections between political economy, science, technology, and employment dynamics(Joyce et al., 2023).

2.5.2 Social l cognitive theory

Social-cognitive theories primarily operate at the algorithmic level. The meta-theoretical implications of this concept can be understood through Marr's (1982) framework, which distinguishes three analytical levels: (1) the computational level, (2) the algorithmic level, and (3) the implementation AL level. At the computational level, the primary objective is to determine which types of inputs result in specific outputs. In practical terms, these inputs can encompass various environmental stimuli and the circumstances in which they are encountered, while outputs refer to the observable behavioral responses triggered by a given stimulus. The algorithmic level aligns with the goals of social-cognitive(Gawronski & Bodenhausen, 2015).

2.5.3 Human-computer interaction (HCI) theory

HCI, also known as Human-Machine Interaction (HMI), is a multidisciplinary field that amalgamates computer science, design, behavioral science, artificial intelligence, and various other disciplines. It encompasses an extensive exploration of the scientific consequences and practical aspects related to the interfaces connecting individuals with computers or intelligent agents(Ren &

Bao, 2020). The convergence of increased networking and enhanced algorithmic capabilities has led to the emergence of business models like ride-hailing platforms such as Uber and Lyft, where a large number of drivers are supervised and coordinated through a mobile application. IS scholars have emphasized the significance of examining the socio-technical aspects of algorithms in managerial practices. Early work in human-computer interaction (HCI) and computer science introduced the term algorithmic management(MÃhlmann & Zalmanson, 2018).

2.6 Research Hypotheses

Hypothesis 1 (H1):

Theory and Previous Research:

Previous research in organizational psychology (Deci & Ryan, 1987)suggests that job autonomy, defined as the degree to which employees have control over their work tasks and decisions, is crucial for employee motivation and satisfaction. Additionally, theories of organizational behavior (Hackman & Oldham, 1976) propose that employees perform better when they have autonomy in their roles. Algorithm management, which involves the implementation and oversight of algorithms to aid decision-making or task allocation, may enhance job autonomy by streamlining processes and empowering employees to make more independent decisions.

Hypothesis: Algorithm management have a positive effect on job autonomy

Hypothesis 2 (H2):

Theory and Previous Research:

Drawing from the same theoretical foundations as Hypothesis 1, the literature suggests that job autonomy is positively associated with employee performance. Research by (Grant & Parker, 2009)found that employees who have greater autonomy in their roles tend to exhibit higher levels of task engagement, creativity, and job satisfaction, leading to improved performance outcomes.

Hypothesis: Job autonomy has a positive effect on employee performance.

Hypothesis 3 (H3):

Theory and Previous Research:

According to mediation theory (Zhao et al., 2010), job autonomy may act as a mediator in the relationship between algorithm management and employee performance. This hypothesis is based on the idea that algorithm management influences job autonomy, which in turn affects employee job satisfaction. Previous studies in organizational behavior have supported the mediating role of job autonomy in various contexts(Humphrey et al., 2007).

Hypothesis: Job autonomy mediates the relationship between algorithm management and employee performance

Hypothesis 4 (H4):

Theory and Previous Research:

Employee attitudes, such as perceptions of fairness and trust in management, are known to influence the effectiveness of organizational interventions(Masterson et al., 2000). In the context of algorithm management and job autonomy, employee attitudes may moderate the relationship between these factors and employee performance. For example, employees with positive attitudes toward algorithm management may be more likely to perceive increased autonomy positively and consequently exhibit higher performance.

Hypothesis: Employee attitudes moderate the relationship between algorithm management, job autonomy, and employee performance.

Hypothesis 5 (H5):

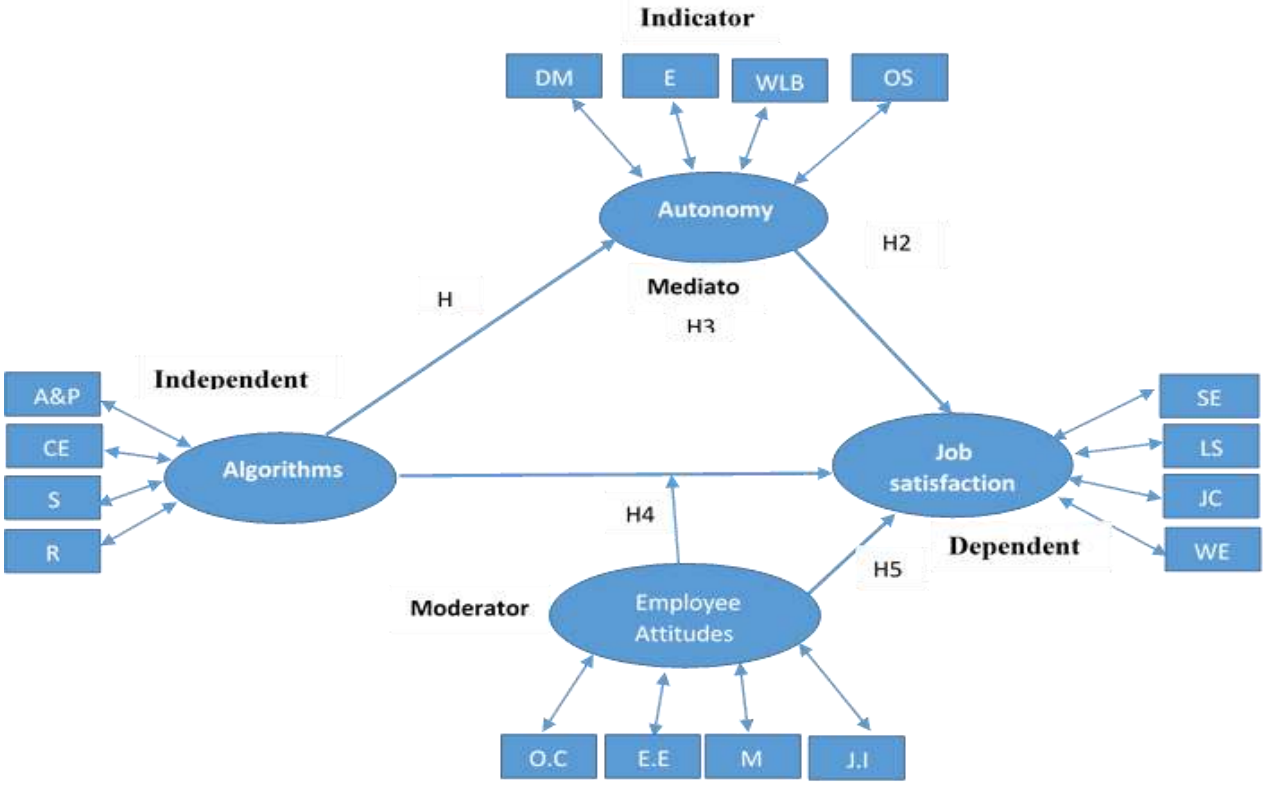
Theory and Previous Research:

Job satisfaction is a key outcome variable in organizational psychology (Judge et al., 2001), and employee attitudes play a significant role in shaping job satisfaction(A., 1976). Therefore, it is theorized that employee attitudes have a direct positive impact on job satisfaction, with employees who hold positive attitudes toward their work environment and organizational practices experiencing higher levels of job satisfaction.

Hypothesis: Employee attitudes have a positive impact on employee job satisfaction.

2.7 Conceptual framework

Figure 2.1: Conceptual framework



Source:(Umboh & Aryanto, 2023)

In this framework, the quality of algorithm management, which includes accuracy, computational efficiency, scalability, and robustness, directly affects job autonomy. Job autonomy, in turn, is influenced by decision-making power, empowerment, work-life balance, and organizational structure to affect employee job satisfaction. Job autonomy plays a pivotal role in determining employee job satisfaction, which is further influenced by self-efficacy, leadership style, job characteristics, and work engagement. Employee attitude moderate these relationships, shaping the overall impact of algorithm management on employee job satisfaction. Employee engagement, organizational commitment, morale, and job involvement can either enhance or inhibit the link between job autonomy and job satisfaction. Finally, employee attitude impacts job satisfaction.

3. Methodologies

The study employs a quantitative research design involving the collection and analysis of numerical data from surveys or experiments(Ayinaddis, 2023). This approach ensures a rigorous and systematic process, enhancing the reliability and validity of research findings. Statistical analysis enables a clearer understanding of relationships between variables and identifies patterns or trends in the data(Gebregziabher et al., 2020). Additionally, numerical data facilitates objective comparisons and reduces bias(Fiernaningsih et al., 2021). The study population, or sampling frame, represents the individuals or units from which a sample is selected. Ensuring a representative sample is crucial for generalizable findings. Purposive sampling was employed to ensure representativeness(Cappellaro & Longo, 2011). The study focused on only 250 respondents, comprising employees and managers of Universitas Muhammadiyah. The unit of analysis is the organization itself, focusing on its characteristics, behaviors, and performance(Rodwell et al., 2023). Individual employees are also considered units of analysis, potentially grouped by job type or department to explore differences in the impact of algorithm management on job autonomy and employee Job satisfaction.

The researcher employed questionnaires and interviews to collect data for this case study at Universitas Muhammadiyah (UMS and UMY). Google form Questionnaires, utilizing a five point Likert scale, ensured clarity through discussions with the sample population of 550, overcoming language or literacy barriers2013(Voorhees et al., 2016). Interviews targeted key informants, aiming to gather extensive knowledge on algorithm management, autonomy, and employee job satisfaction(hiller & diluzio, 2004; Richard P. Bagozzi, 2017). The reliability of survey tools was ensured through test-retest methods, with composite reliability and Cronbach's alpha values examined for reliability testing(González-de la Torre et al., 2023). Outer model analysis assessed reliability, discriminant validity, and indicator reliability and validity(Hair et al., 2017). Microsoft Excel, SPSS Software, and smart PLS were used for data

analysis, including hypothesis testing for SEM and IPMA for variable significance and performance assessment(Daoud, 2018). These methodologies provide insights into variable relationships and guided decision-making across various domains(Tailab, 2020).

3.1 Operational definition and measurement variables

VARIABLES	*SOURCE*	*OPERATIONAL DEFINATION*
Algorithm Management	*(Schildt, 2017)*	*It involves overseeing and improving algorithms used in various fields like machine learning, data analysis, and artificial intelligence to ensure they remain effective and efficient. It's especially crucial in data science and AI, where algorithms play a vital role in decision-making and problem-solving*
1. Accuracy and Precision	*(Kang et al., 2019)*	*This evaluates the exactness and reliability of the algorithms in their decision-making processes.*
2. Computational Efficiency	*(Sanderson & Lovell, 2009)*	*This measures how efficiently the algorithms handle data and tasks while conserving computational resources.*
3. Scalability	(Zhang et al., 2019)	*Assesses the algorithms' capacity to adapt to increased workloads or expanding datasets without compromising performance.*
4. Robustness	*(Chlebus & Kowalski, 2006)*	*Examines the algorithms' ability to withstand variations and unforeseen scenarios, ensuring they handle diverse situations effectively.*
Employee Job Satisfaction	*(Sageer, 2012)*	*The general sense of well-being and fulfillment an individual experiences concerning their job or professional engagements. It encompasses the affirmative emotions and sentiments that workers hold in regard to their tasks and the workplace setting.*
1. Self-Efficacy	*(Luthans & Peterson, 2002)*	*This assesses an employee's belief in their ability to perform tasks and make effective decisions.*
2. Transformational Leadership	*(Choi et al., 2016)*	*It gauges the extent to which leadership motivates and inspires employees to excel, thereby enhancing job satisfaction.*
3. Job Characteristics	*(Katsikea et al., 2011)*	*Appraises the intrinsic attributes of the job, including autonomy, variety of tasks, and feedback, which can significantly impact satisfaction.*
4. Work Engagement	*(Rai & Maheshwari, 2021)*	*This quantifies the level of engagement and commitment employees have towards their work, contributing to overall job satisfaction.*
Job Autonomy	*(Khoshnaw & Alavi, 2020)*	*Job autonomy encompasses the extent of control and discretion an employee has over their work. It encompasses decision-making authority, empowerment, the equilibrium between work and personal life, and the organizational framework.*
1. Decision Making	*(Khoshnaw & Alavi, 2020)*	*This evaluates the level of authority employees possess to make decisions concerning their roles and tasks.*
2. Employee Empowerment	*(Choi et al., 2016)*	*It measures the extent to which employees feel empowered in their work, reflecting their level of autonomy.*
3. Work-Life Conflict	*(Chang et al., 2023)*	*Work-life conflict measures the equilibrium between work and personal life and its influence on job autonomy.*
4. Organizational Structure	*(Katsikea et al., 2011)*	*Organizational structure explores the framework within which employees operate and how it either facilitates or hampers job autonomy.*

Employee Attitudes	*(Newman et al., 2010)*	*The overall contentment and well-being experienced by employees within their job roles in an organization. I.e., feelings and opinions that an individual holds toward their job, workplace, colleagues, and the organization as a whole*
1. Employee Engagement	*(Mackay et al., 2017)*	*It measures of how much individuals invest their physical, cognitive, and emotional efforts into their job performance.*
2. Organizational Commitment	*(heinen, 2016)*	*The level of emotional connection an individual feels toward their organization encompassing dedication, consistent attendance, conscientious work, safeguarding company assets, and alignment with organizational goals.*
3. Morale	*(Kumar & Velmurugan, 2020)*	*The overall sense of well-being, satisfaction, and contentment that employees feel within an organization. It encompasses their attitude, motivation, and emotional outlook towards their work, colleagues, and the company as a whole.*
4. Job Involvement	*(Schraeder et al., 2006)*	*The extent to which an individual identifies with is personally engaged in and cares about their job. It reflects the degree to which an employee is emotionally invested in their work and is committed to the goals and values of their organization.*

***Source**:(Oh & Park, 2016)*

4. Data Analysis and Results

4.1 Sample Analysis

A comprehensive google form questionnaire survey was designed and distributed with the aim of exploring the impact of algorithm management on employee job satisfaction, mediating the role of job autonomy and employee attitude as the moderator (A case study on 2 best Universitas of Muhammadiyah). Out of the 250 Google form questionnaires issued to respondents, including lecturers, administrators, and others, only 215, representing 86 % of questionnaires, were filled out, processed and analyzed. This response rate exceeded expectations, particularly considering the typically lower response rates associated with administering questionnaires via Google Forms.

4.2 Data presentation and Results

Part one of the questionnaires was used to collect the data regarding the socio-demographic attributes of the respondents. It contained seven questions, i.e. Position of respondents in the organization, Department of respondents, Age of respondents, Gender, Educational qualification, Institutions, and Year of experience of respondents.

Table 4.1 Response Biography

Characteristics	Frequency	Percent (%)
1. Position		
Administration	50	23.3
Lecturers	150	69.8
Others	15	7.0
2. Department		
Accounting	12	5.6
Administration	2	0.9
Agama	15	7.0
Al-Quran and Tafseer	1	0.5
Architecture	2	0.9
Bahasa Indonesia	1	0.5
Chemical engineering	2	0.9
Communication	4	1.9
Doctor	11	5.1
Economics	2	0.9
English education	12	5.6
Geography	13	6.0
Health science	2	0.9
Industrial engineering	26	12.1
Physiotherapy	1	0.5
Psychology	1	0.5
Public health	1	0.5
Teknik Elektro	2	0.9
Teknik sipil	1	0.5
computer science	4	1.9
Dentistry	2	0.9
Mechanical professional programs	4	1.9
Biology	7	3.3
Early childhood Teacher Education	1	0.5
Elementary Teachers Education	8	3.7
Pancasila and Civic Education	1	0.5
3. Ages		
20 – 30 Years	15	7.0
31 – 40 Years	55	25.6
41 – 50 Years	76	35.3
51 Years Above	69	32.1
4. Gender		
Male	141	65.6
Female	74	34.4

Information and Technology	2	0.9
International office	1	0.5
Islamic economic law	3	1.4
Law	4	1.9
Management	7	3.3
Mechanical Engineering	3	1.4
Medicine	3	1.4
Nursing	10	4.7
Nutrition	24	11.2
Pendidikan dasar	8	3.7
Pendidikan matematika	10	4.7
Pharmacists	2	0.9
5. Educational level		
Ph.D.	44	20.5
Masters	155	72.1
Bachelors	16	7.4
6. Institutions.		
UMS	174	80.9
UMY	41	19.1
7. Years of Experience		
Less than 1 year	4	1.9
1 – 2 Years	17	7.9
2 – 5 Years	63	29.3
5 Years Above	131	60.9
Total	**215**	**100.0**

Source: author (2024)

Table 4.1 offers a detailed overview of respondent characteristics. Among the positions, Lecturers constitute the largest group (69.8%), indicating the predominant role within academic institutions. The departmental distribution showcases diversity, with Industrial Engineering (12.1%) and Nutrition (11.2%) among the prominent disciplines. Age-wise, a mature workforce is evident, with a significant portion falling within the 41-50 years age group (35.3%). Gender distribution skews male (65.6%), underscoring a gender disparity. Educationally, the majority hold Master's degrees (72.1%), reflecting the high educational attainment typical of academia. UMS dominates affiliations (80.9%), highlighting institutional representation. Experience-wise, a substantial proportion boasts 5 years and above (60.9%), indicating a seasoned workforce. These insights facilitate a nuanced interpretation of study findings within the academic context, crucial for informed decision-making.

Table 4.2 Descriptive Statistics

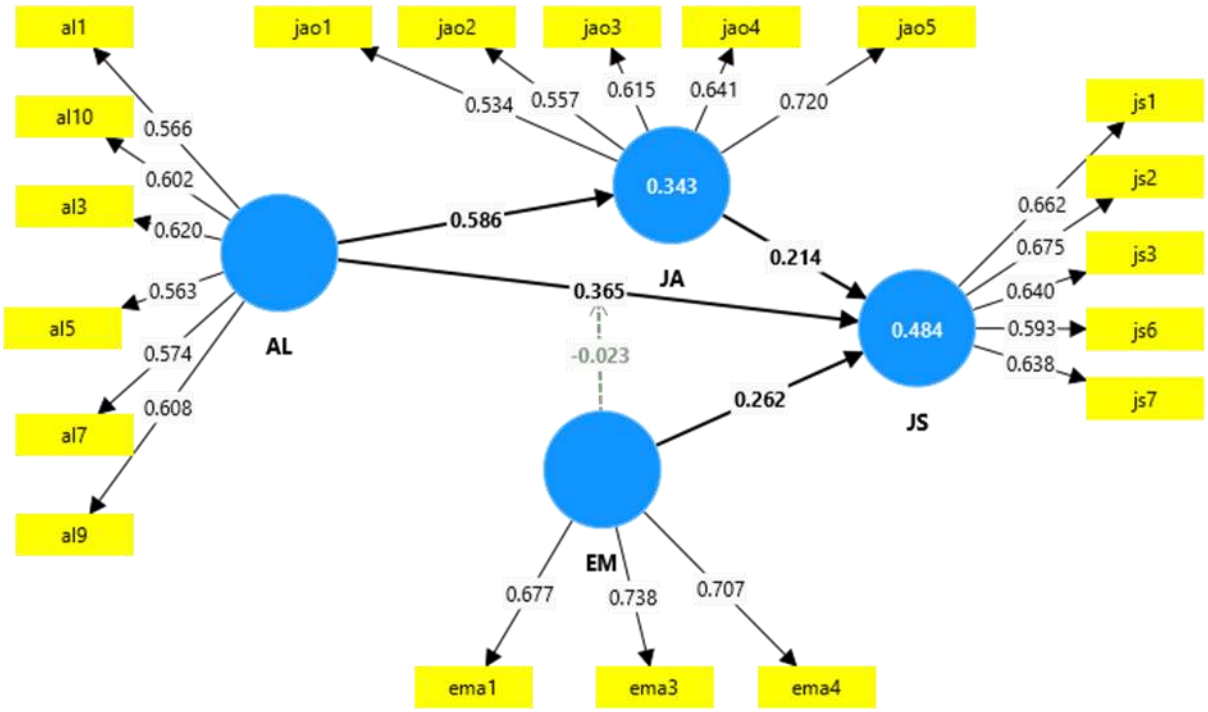
Factors	N	Minimum	Maximum	Mean	Std. Deviation
Algorithms	215	1.00	4.60	2.8586	0.64772
Employee Job Satisfaction	215	1.00	4.71	2.9934	0.70173
Job Autonomy	215	1.00	4.86	2.9103	0.74194
Employee Attitude	215	1.00	4.50	2.7360	0.73690
Valid N (listwise)	215				

Source: Author (2024).

Table 4.2 provides descriptive statistics for four essential factors: Algorithms, employee job satisfaction, job autonomy, and employee attitude. The mean scores for these factors depict a moderate level of perceived effectiveness in the overall algorithms: 2.8586, satisfaction the overall Employee Job Satisfaction: 2.9934, the overall Job Autonomy: 2.9103, and the overall Employee Attitude: 2.7360 among employees. Notably, the spread of scores reveals moderate variability, with ranges from 1.00 to 4.60, 4.71, 4.86, and 4.50, respectively, alongside corresponding standard deviations of 0.64772, 0.70173, 0.74194, and 0.73690. This variability indicates differing perceptions among individuals across the organization, underscoring the importance of understanding algorithms management and areas for enhancement.

4.3 Outer model analysis

Figure 2: Outer Model Analysis presents the indicators used in the study, their loadings, and significance levels, highlighting their contribution to the overall reliability and validity of the measurement model.



Source: author

4.3.1: Discriminant validity

Table 4. 3.1: Outer Loading Matrix

Factors		Original samples
1.	**Algorithms**	
a)	I consider decisions when it comes to tasks involving mechanical skills.	0.566
b)	The interaction of automation decision-making tools is important in my work.	0.620
c)	Digital management creates better transparency.	0.563
d)	I believe that digital management processes can be adopted to various aspects of my work.	0.574
e)	I feel reassured by the accuracy and precision of the digital management processes utilized in my work.	0.608
f)	I feel confident in the accuracy of digital management software implemented in my work.	0.602
2.	**Employee job satisfaction**	
a)	I am satisfied with the use of digital machines to the success of my work	0.662
b)	I am satisfied with my job responsibilities.	0.675
c)	I am happy with my supervisor's leadership style.	0.640
d)	I feel content with the level of engagement in my daily work	0.593
e)	I feel comfortable working with machines.	0.638
3.	**Job autonomy**	
a)	I can set up schedules by myself.	0.534
b)	I have the ability to control my tasks and schedule.	0.557
c)	I have the ability to control my tasks and schedule.	0.615
d)	My job depends on the organizational structure at the work place.	0.641
e)	I feel empowered in my work.	0.720
4.	**Employee attitude**	
a)	I like working in this company.	0.677
b)	My company fits my competencies.	0.738
c)	The physical facilities and work place are suitable.	0.707
Employee attitude * Algorithms		**1.000**

Source: Author (2024).

Table 4.3.1 illustrates the outer loading matrix, delineating the connections between observed variables (indicators) and their corresponding latent constructs (factors), such as Algorithms, Job Satisfaction, Job Autonomy and Employee Attitude, respectively. Algorithms (AL): Variables Al 1 through Al 10 showcase outer loadings ranging from 0.563 to 0.620, indicating moderate to strong associations with the Algorithms factor. Job Satisfaction (JS): Variables Js1 through Js7 exhibit outer loadings spanning from 0.593 to 0.675, signifying moderate to strong associations with the Job Satisfaction factor. Job Autonomy (JA): Variables Ja1 through Ja5 demonstrate outer loadings ranging from 0.534 to 0.720, implying moderate to strong associations with the Job Autonomy factor. Employee Attitude (EA): Variables EA1 through EA4 display outer loadings ranging from 0.677 to 0.738, suggesting moderate to strong associations with the Employee Attitude factor. Interaction between Employee Attitude and Algorithms (EA*AL): The interaction variable between Employee Attitude and Algorithms manifests a perfect outer loading of 1.000, indicating a robust association between this interaction term and the respective latent constructs. However, the overall findings from the outer loading matrix underscore satisfactory associations between observed variables and their underlying latent constructs, thereby fortifying the validity of the measurement model.

Table4.3.2: Fornell – Larcker

Factors	AL	JS	JA	EA
Algorithms	0.589			
Job Satisfaction	0.615	0.642	0.559	0.549
Job Autonomy	0.586		0.617	0.516
Employee Attitude	0.499			0.708

Source: Author (2024).

Table 4.3.2 analyzes discriminant validity; the provided data unveils insights into the reliability and validity of the structural equation model through inter-construct correlations, Cronbach's alpha, composite reliability (rho_c), and Average Variance Extracted (AVE). Notably, moderate correlations between constructs such as Job Satisfaction (JS) with Algorithms (AL) (0.615) and Employee Attitude (EA) (0.642), as well as Job Autonomy (JA) with AL (0.586) and EA (0.617), suggest potential relationships. However, a relatively weaker correlation between AL and EA (0.499) implies their distinctiveness. Regarding reliability, all constructs exhibit satisfactory internal consistency, with Composite reliability values surpassing 0.7 (AL: 0.761, JS: 0.751, JA: 0.752, EA: 0.778), ensuring consistent measurement of underlying concepts. Additionally, robust composite reliability (rho_c) values further validate reliability across all constructs. Despite this, varying AVE values indicate differences in convergent validity, with AL and JA displaying relatively weaker AVE values (AL: 0.559, JA: 0.516) compared to JS and EA (JS: 0.642, EA: 0.708), suggesting the need for refinement to bolster convergent validity. Thus, while the model demonstrates satisfactory reliability and correlations, enhancing convergent validity through further model refinement is essential for its overall robustness.

Table 4.1: Model Fit

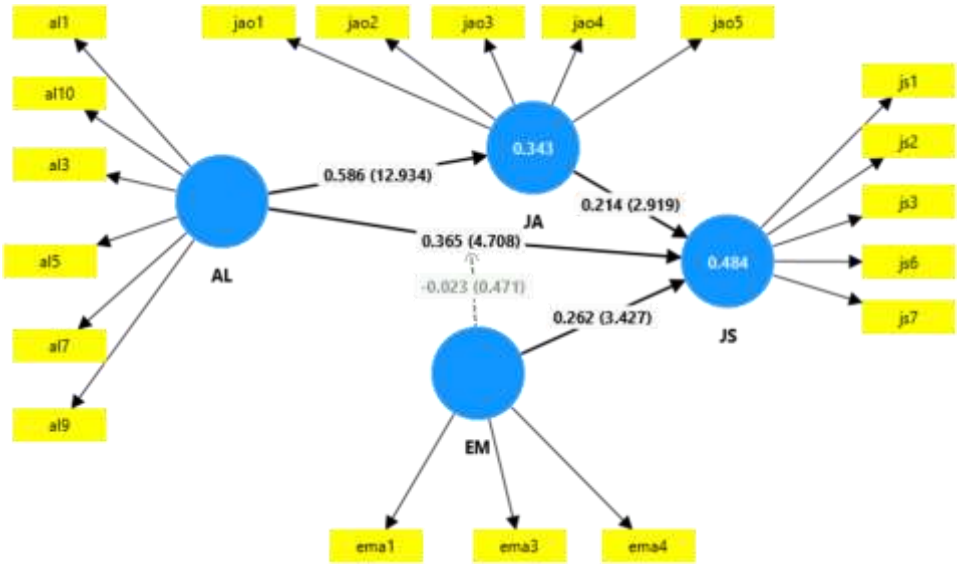
	Saturated model	Estimated model
NFI	**0.591**	**0.575**

Source: Author (2024).

Table 4.3.3 illustrates the model fit indices for the saturated model and the estimated model, focusing on the Normal Fit Index (NFI) to assess the goodness of fit relative to the observed data. This score represents the fit of the saturated model, where every parameter is estimated, and the model ideally reproduces the observed data. While an NFI of 1.0 signifies a perfect fit, an NFI of 0.591 indicates that the saturated model doesn't precisely capture the observed data. The NFI for the estimated model reflects its fit compared to the saturated model, with some parameters potentially constrained or simplified. With an NFI slightly lower than the saturated model of 0.575, the estimated model exhibits a comparable or slightly decreased fit. In a nutshell, both models demonstrate moderate fits to the data, with the estimated model marginally underperforming relative to the saturated model in terms of NF.

4.4 inner model analysis

Figure 3: Inner model analysis presents the path coefficients, mean values, standard deviations, and significance levels of the relationships between algorithm management, job autonomy, employee attitudes, and job satisfaction.



Source: author

4.4.1: Indicator reliability

Table 4.4.1: Construct Reliability and Validity test

Factors	Cronbach's alpha	Composite reliability(rho_c)	Average variance extracted(AVE)
Algorithms	0.624	0761	0.347
Job Satisfaction	0.644	0.751	0.501
Job Autonomy	0.591	0.752	0.380
Employee Attitude	0.502	0.778	0.413

Source: Author (2024).

Table 4.4.1, In a Construct Reliability Test, the reliability of the measurement model is assessed using metrics such as Composite Reliability (ρc) and Average Variance Extracted (AVE). The results for the factors analyzed reveal that all factors exhibit high Composite Reliability values ranging from 0.751 to 0.778, indicating the internal consistency of each factor's items in measuring the underlying construct. Notably, Job Satisfaction demonstrates the highest level of convergent validity with an AVE of 0.501, followed by Employee Attitude and Job Autonomy with AVE values of 0.413 and 0.380, respectively. However, Algorithms have the lowest AVE value of 0.347, implying that only 34.7% of the variance is explained by the latent construct. These findings underscore the importance of interpreting these results within the specific study context to ensure the validity and reliability of the measurement model.

Table 4.4.2: Correlations

Factors		Algorithms	Employee Job Satisfaction	Job Autonomy	Employee Attitude
Algorithms	Pearson Correlation	1			
Employee Job Satisfaction	Pearson Correlation	0.666**	1		
Job Autonomy	Pearson Correlation	0.639**	0.624**	1	
Employee Attitude	Pearson Correlation	0.620**	0.566**	0.577**	1
Total	Pearson Correlation	0.896**	0.850**	0.847**	0.766**

Source: Author (2024).

The correlation table 4.4.2 unveils Pearson correlation coefficients illustrating the relationships between Algorithms, Employee Job Satisfaction, Job Autonomy, and Employee Attitude. Notably, significant positive correlations emerge across various pairs of factors, emphasizing their interconnectedness within the organizational context. Specifically, strong positive correlations are

observed between Algorithms and both Employee Job Satisfaction (0.666) and Job Autonomy (0.639), signifying that employees who perceive algorithms as effective are more likely to report higher levels of job satisfaction and perceive greater autonomy in their roles. Additionally, a robust positive correlation exists between Algorithms and Employee Attitude (0.620), indicating that positive perceptions of algorithm effectiveness correlate with favorable attitudes among employees. Further reinforcing these findings, strong positive correlations are evident between Employee Job Satisfaction and both Job Autonomy (0.624) and Employee Attitude (0.566), as well as between Job Autonomy and Employee Attitude (0.577). These correlations suggest that higher levels of job satisfaction and perceived autonomy correspond to more positive attitudes among employees. Overall, these results underscore the importance of considering multiple factors in understanding employee perceptions and attitudes, offering valuable insights for organizational strategies aimed at enhancing employee satisfaction, autonomy, and overall effectiveness.

Table 4.4.3: Collinearity Statistics (VIF) – Inner Model -Matrix

Factors	AL	JS	JA	EA
Algorithms		**1.700**	**1.000**	
Job Satisfaction		**-**		
Job Autonomy		**1.695**		
Employee Attitude		**1.499**		
EA* AL		**1.088**		

Source: Author (2024).

Table 4.4.3 illustrates collinearity statistics through the Variance Inflation Factor (VIF) within the inner model matrix, encompassing Algorithms (AL), Job Satisfaction (JS), Job Autonomy (JA), and Employee Attitude (EA). The VIF values depict the degree of collinearity between variables. Algorithms exhibit a VIF of 1.700, suggesting moderate collinearity, while Job Autonomy follows closely with a VIF of 1.695. Employee Attitude presents a VIF of 1.499, indicating moderate collinearity. Notably, the interaction term between Employee Attitude and Algorithms (EA * AL) displays minimal collinearity with a VIF of 1.088. Overall, VIF values remain below the common threshold of 5, signifying acceptable collinearity levels. However, the presence of moderate collinearity among Algorithms, Job Autonomy, and Employee Attitude implies some interdependence among these factors, necessitating consideration in subsequent analyses.

Table 4.4.4: Model Fit

	Saturated model	Estimated model
NFI	**0.591**	**0.575**

Source: Author (2024).

Table 4.4.4 illustrates the model fit indices for the saturated model and the estimated model, focusing on the Normal Fit Index (NFI) to assess the goodness of fit relative to the observed data. This score represents the fit of the saturated model, where every parameter is estimated, and the model ideally reproduces the observed data. While an NFI of 1.0 signifies a perfect fit, an NFI of 0.591 indicates that the saturated model doesn't precisely capture the observed data. The NFI for the estimated model reflects its fit compared to the saturated model, with some parameters potentially constrained or simplified. With an NFI slightly lower than the saturated model of 0.575, the estimated model exhibits a comparable or slightly decreased fit. In a nutshell, both models demonstrate moderate fits to the data, with the estimated model marginally underperforming relative to the saturated model in terms of NFI.

4.5 Hypothesis test.

4.5.1 Direct effect.

Table 4.5.1 path Coefficients- Mean, Standard Deviation, Value, and P value

Factors	Original Sample	Sample Mean(M)	Standard Deviation(STDEV)	T. statistics(|O/STDEV|)	P value
AL ->JA	0.586	0.594	0.045	12.934	0.000
JA - > JS	0.214	0.212	0.073	2.919	0.004
AL - > JS	0.365	0.368	0.077	4.708	0.000
EA - > JS	0.262	0.268	0.077	3.429	0.001
EA * AL-> JS	-0.023	-0.023	0.048	0.471	0.638

Source: Author (2024).

Table 4.5.1 presents the path coefficients along with their mean, standard deviation, T statistics, and corresponding p-values for the relationships between factors in the model:

Hypothesis 1: Algorithm management has a positive impact on job Autonomy (AL -> JA).
The mean path coefficient from Algorithms to Job Autonomy is 0.594, with a standard deviation of 0.045. The T statistics value is 12.934, indicating a highly significant relationship ($p < 0.001$) between Algorithms and Job Autonomy. Hence, **hypothesis 1** is accepted, which means Algorithm management has a positive impact on job Autonomy.

Hypothesis 2: Job Autonomy has a positive impact on job Satisfaction (JA -> JS).
The mean path coefficient from Job Autonomy to Job Satisfaction is 0.212, with a standard deviation of 0.073. The T statistics value is 2.919, indicating a significant relationship ($p = 0.004$) between Job Autonomy and Job Satisfaction. Therefore, Hypothesis 2 is accepted, indicating that Job Autonomy has a direct impact on job Satisfaction.

Hypothesis 3: Algorithms management has a positive relationship with job satisfaction (AL -> JS) (Algorithms to Job Satisfaction):
The mean path coefficient from Algorithms to Job Satisfaction is 0.368, with a standard deviation of 0.077. The T statistics value is 4.708, indicating a highly significant relationship ($p < 0.001$) between Algorithms and Job Satisfaction. **Hence, hypothesis 3** is accepted, which means that Algorithms management has a direct impact on job satisfaction.

Hypothesis 4: Employee characteristics will moderate the relationship between algorithm management and employee job satisfaction (EA * AL -> JS).
The mean path coefficient for the interaction between Employee Attitude and Algorithms to Job Satisfaction is -0.023, with a standard deviation of 0.048. The T statistics value is 0.471, indicating no significant relationship ($p = 0.638$) between this interaction and Job Satisfaction. Hence, the Hypothesis is rejected because the interaction between Employee Attitude and Algorithms does not significantly impact Job Satisfaction in the analyzed data.

Hypothesis 5: Employee Attitude has a positive impact on job Satisfaction (EA -> JS).
The mean path coefficient from Employee Attitude to Job Satisfaction is 0.268, with a standard deviation of 0.077. The T statistics value is 3.429, indicating a highly significant relationship ($p = 0.001$) between Employee Attitude and Job Satisfaction. The results indicate that employee attitude has a positive relationship with job satisfaction. Hence, **Hypothesis 5** is accepted.

4.5.2: Indirect Effect Top of Form

Table 4.5.2: Specific Indirect Effects – Mean, Stdev, t values, P values

Factor	Original Sample	Sample Mean(M)	Standard Deviation (STDEV)	Statistics ($\|O/STDEV\|$)	P values
AL ->JA->JS	0.125	0.125	0.044	2.855	0.004

Source: Author (2024).

The indirect effect analysis in Table 4.5.2 evaluates the influence of Algorithms (AL) on Job Satisfaction (JS) mediated by Job Autonomy (JA). This analysis is backed by the metrics: a sample mean (M) of 0.125, indicating that an increase in AL is associated with a rise in JS via JA; a standard deviation (STDEV) of 0.044, showing low variability and suggesting that the indirect effect is consistent across samples; a t-statistic of 2.855, indicating that the effect size is significantly different from zero and not due to random chance; and a p-value of 0.004, strongly rejecting the null hypothesis that there is no effect. Collectively, these figures affirm that the effectiveness or use of algorithms positively impacts job satisfaction by enhancing job autonomy. This mediated relationship is crucial for understanding how technological implementations can shape organizational dynamics, particularly in terms of enhancing employee satisfaction through structural changes like increased autonomy.

Figure 4.4: IPMA Analysis

The Importance-Performance Map Analysis (IPMA) is a valuable tool for assessing the significance and effectiveness of different constructs in achieving desired outcomes.

In the context of this study on algorithm management, job autonomy, and employee job satisfaction, the IPMA helps identify areas that require improvement and prioritize actions based on their importance and performance levels.

Importance Axis (X-axis): This represents the importance of each construct in influencing employee job satisfaction. Higher values indicate greater significance.
Performance Axis (Y-axis): Indicates the performance level of each construct based on observed data. Higher scores reflect better performance.

Quadrants:
Quadrant 1: High Importance, High Performance (Maintain excellence)
Quadrant 2: High Importance, Low Performance (Focus for improvement)
Quadrant 3: Low Importance, High Performance (Sustain performance)
Quadrant 4: Low Importance, Low Performance (Consider for reduction)
By analyzing the constructs' positions on the IPMA, researchers can prioritize interventions to enhance job satisfaction by focusing on areas of high importance and low performance, ultimately improving organizational outcomes and employee well-being.

4.6 Discussion

The research explored the impact of algorithm management on employee job satisfaction with a focus on the mediating role of job autonomy and the moderating effect of employee attitudes(Ilo, 2021). Unveiled several significant findings. Firstly, it revealed a non-linear relationship between algorithm frequency and life satisfaction, influenced by worker characteristics(Virick et al., 2015). Secondly, it highlighted the pivotal role of AI-supported autonomy in driving innovation within the hospitality sector, serving as a key determinant of employee job satisfaction(Kong et al., n.d.). Thirdly, organizational and individual psychological climates were identified as shaping work design characteristics and autonomy dimensions, thereby influencing positive work attitudes and behaviors(Shakil et al., 2023). Moreover, individual personality traits were observed to shape responses to job autonomy and algorithm use within the framework of human-computer interaction theory(Bar ambones et al., 2021). Furthermore, the research analyzed employee attitudes and emphasized their importance within organizational contexts, albeit without significant moderating effects on algorithms and job satisfaction(Zammitti et al., 2022). The correlation between a positive outlook towards work, organizational commitment, and heightened job satisfaction was established, along with the relationship between job satisfaction and positive emotional well-being derived from job evaluation and experiences(Ahmad et al., 2010). Lastly, factors such as advancement opportunities, employee engagement, and organizational commitment were identified as significant influencers of job satisfaction(Sudiarditha, 2019).

These findings provide valuable insights for organizations aiming to enhance employee job satisfaction through effective algorithm management and job autonomy practices, emphasizing the need to consider both technological and human factors in organizational settings. However, acknowledging the limitations of the study, including sample size and specific context, is

essential, along with the recommendation for future research to address these limitations and explore additional factors influencing the relationship between algorithm management, job autonomy, and employee attitudes. Practical recommendations include developing training programs to enhance job autonomy and fostering a supportive organizational culture valuing employee well-being alongside technological advancements.

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5. Conclusion:

The research on the impact of algorithm management on employee job satisfaction has provided valuable insights into the complex dynamics at play within organizational settings. The study focused on understanding how algorithm management influences job autonomy, which in turn affects employee job satisfaction, with employee attitudes playing a moderating role. The findings of the study highlighted a positive relationship between algorithm management and job autonomy, emphasizing the importance of effective management strategies in empowering employees. Job autonomy emerged as a significant predictor of employee job satisfaction, underscoring the need for organizations to prioritize autonomy in the workplace. While the moderating role of employee attitudes was not supported, the direct positive impact of employee attitudes on job satisfaction was evident.

5.1 Theoretical and Managerial Contributions:

Interpreting these results in the context of existing literature and research, it is clear that organizations must consider both technological advancements and human factors when designing strategies to enhance employee well-being and satisfaction. By fostering job autonomy and creating a positive work environment, organizations can improve job satisfaction levels and ultimately enhance overall employee performance and retention.

The implications of this study extend to practical applications in organizational settings, where the findings can guide the development of tailored management practices that promote job autonomy and employee satisfaction. By acknowledging the limitations of the study, such as sample size and research context, future research can build upon these findings to further explore the intricate relationships between algorithm management, job autonomy, and employee attitudes.

5.2 Limitations:

While the study provides valuable insights, it is essential to acknowledge its limitations. These may include constraints related to sample size, research context, and the generalizability of findings. Addressing these limitations in future research can enhance the robustness and applicability of the study's conclusions.

5.3 Future Research:

In light of the research findings, it is recommended that organizations prioritize employee empowerment through job autonomy initiatives and cultivate a supportive culture that values employee well-being. Future research endeavors should delve deeper into the long-term effects of algorithm management on job satisfaction and consider diverse organizational contexts to enhance the generalizability of findings.

In conclusion, this study contributed to the growing body of knowledge on organizational behavior and human resource management, emphasizing the importance of balancing technological advancements with human-centric approaches to create a positive and fulfilling work environment for employees.

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5.4 Theoretical implications

The research contributes to the literature by providing a deeper understanding of the impact of algorithm management on employee job satisfaction. By exploring the relationships between algorithm management, job autonomy, and employee attitudes, the study enriches existing theoretical frameworks related to technology adoption, organizational behavior, and human resource management. The findings validate job autonomy as a critical factor influencing employee job satisfaction. This empirical support strengthens theoretical perspectives that emphasize the importance of autonomy in enhancing employee well-being and performance. By confirming the mediating role of job autonomy in the relationship between algorithm management and employee satisfaction, the study reinforces theories that highlight the significance of autonomy in organizational settings. While the moderating role of employee attitudes was not fully supported in the study, the exploration of these factors provides valuable insights for theoretical development. By investigating how employee attitudes interact with algorithm management and job autonomy, the research offers a nuanced understanding of the complexities involved in shaping employee perceptions and satisfaction. These insights can inform future theoretical frameworks that incorporate the role of attitudes in organizational dynamics.

The study's focus on employee job satisfaction contributes to existing theories on job satisfaction by highlighting the multifaceted nature of satisfaction in the context of algorithm management. The findings underscore the interconnectedness of algorithm management, job autonomy, and employee attitudes in shaping job satisfaction outcomes. This contribution enhances theoretical

perspectives on job satisfaction by emphasizing the importance of considering technological influences and individual perceptions in understanding satisfaction levels. The research integrates elements of contingency theory and the Technology Acceptance Model (TAM) to explain the relationships between algorithm management, job autonomy, and employee satisfaction. By drawing on these theoretical frameworks, the study demonstrates how organizational and individual factors interact to influence employee outcomes. This integration enhances our theoretical understanding of how technology adoption and management practices impact employee attitudes and behaviors.

The theoretical implications of the study extend to the development of evidence-based strategies for organizations seeking to enhance employee job satisfaction through effective algorithm management and job autonomy initiatives. By grounding these strategies in theoretical frameworks supported by empirical findings, organizations can make informed decisions that align with theoretical perspectives on organizational behavior and management. Therefore, the theoretical implications derived from the literature and findings of the research underscore the importance of considering multiple theoretical perspectives, empirical evidence, and practical implications in understanding the complex relationships between algorithm management, job autonomy, employee attitudes, and job satisfaction. By integrating these insights into theoretical frameworks and organizational practices, researchers and practitioners can advance our understanding of how technology and human factors intersect to shape employee experiences and organizational outcomes.

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