

THE ROLE OF SOCIO-TECHNICAL SYSTEMS IN OPTIMIZING EMPLOYEE PERFORMANCE IN THE MIDDLE OF LIMITED HUMAN RESOURCES AND HIGH WORKLOAD: A STUDY ON DIRECTORATE GENERAL OF TREASURY, CENTRAL JAVA REGIONAL OFFICE

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Abstract

This study aims to explore how socio-technical systems (STS) influence employee performance in government institutions, particularly under conditions of limited human resources and high workloads. The research was conducted at the Directorate General of Treasury (DJPb), Central Java Regional Office. Using a quantitative research design and survey method, data were collected from 44 employees using structured questionnaires measuring three main variables: socio-technical systems, workload, and employee performance. The results indicate that STS has a significant and positive effect on employee performance, suggesting that effective integration of social and technological elements can improve organizational outcomes. Although workload also affects performance significantly, it does not moderate the relationship between STS and employee performance. This indicates that while workload pressure remains a challenge, a well-implemented socio-technical system can independently boost employee productivity. The findings contribute to the limited research in the Indonesian public sector context and provide practical implications for decision-makers aiming to enhance efficiency and reduce burnout. Strengthening the alignment between digital tools and human capabilities is essential for maintaining performance amidst increasing administrative demands.

Keywords: Socio-Technical Systems, Workload, Employee Performance, Public Sector, Moderated Regression Analysis

INTRODUCTION

In today's dynamic work environment, public organizations face significant challenges such as limited human resources and increasing workload. This is evident in the Central Java Regional Office of the Directorate General of Treasury (DJPb), where 89% of employees reportedly experience high levels of burnout (DJPb, 2024). The socio-technical systems (STS) approach offers a potential solution by integrating social aspects (people, culture, organizational structure) and technical components (tools, technologies, processes) to optimize organizational performance (Appelbaum, 1997; Sharma, 2024). Despite the increasing interest in STS, its application in public sector settings, especially in Indonesia, remains limited.

This study contributes both theoretically and practically by examining the impact of STS on employee performance, while considering workload as a moderating variable. The results offer practical implications for public institutions like DJPb in addressing human resource limitations through better socio-technical integration. The novelty of this research lies in its focus on public financial institutions and the integration of workload into the socio-technical performance model.

LITERATURE REVIEW AND HYPOTHESIS FORMULATION

Socio-Technical Systems (STS) theory emerged in the 1950s through the work of Trist and Bamforth (1951) at the Tavistock Institute. It emphasizes that both technical and social subsystems must be jointly optimized (Appelbaum, 1997). The social subsystem includes human roles and culture, while the technical subsystem includes tools, procedures, and machines (Fischer & Herrmann, 2011).

Workload, based on Job Demands-Resources (JD-R) theory, is considered a job demand that affects employee well-being and performance (Bakker & Demerouti, 2007). Excessive workload, when not supported by adequate resources, can result in stress, burnout, and reduced performance (Putri & Rahyuda, 2019).

Employee performance is defined as task achievement based on quality, efficiency, and timeliness (Pradhan & Jena, 2017). High performance reflects an organization's effectiveness in aligning individual capability and systemic support.

H1: Socio-Technical Systems have a positive effect on Employee Performance.

H2: Workload moderates the relationship between Socio-Technical Systems and Employee Performance

RESEARCH METHODS

This study used a quantitative survey method targeting employees of the Directorate General of Treasury, Central Java Regional Office in Semarang, conducted in March 2024. The population consisted of 68 employees, with a sample of 58 selected using Slovin's formula and simple random sampling to ensure equal selection chances (Suliyanto, 2018). Data were collected through questionnaires measuring Socio-Technical Systems (STS), Workload, and Employee Performance using a 5-point Likert scale (Suliyanto, 2011).

STS reflects the balance between technical tools and social systems in the workplace (Sandoval, 2017). Workload involves task pressure and resource strain (Korunka & Kubicek, 2017), while performance refers to work quality, timeliness, and adaptability (Wright et al., 1995). Instrument testing included validity and reliability checks using Cronbach's Alpha (Suliyanto, 2011).

Data analysis involved descriptive statistics, classical assumption tests (normality, multicollinearity, heteroscedasticity, and linearity), and regression analysis. Hypotheses were tested using R^2 , F-test, t-test, and Moderated Regression Analysis (MRA) to examine the moderating role of workload on the STS–performance relationship (Suliyanto, 2011)..

Equation

You should write the equation in the Calibri Light font or the Symbol font. If there are multiple equations, give them the number of the equations. The number of equations must be sequential, placed on the far right, namely (1), (2), and so on. Use tags to make the writing of the equation more concise. Use italic fonts for variables, bold fonts for vectors.

$$1. \quad Y = \beta_0 + \beta_1 X + \beta_2 Z + \beta_3 (X * Z) + \varepsilon \dots\dots\dots (1)$$

where:

Y: Employee Performance X:

Socio-Technical System Z:

Workload

X*Z: Interaction between Socio-Technical System and Workload

RESULTS AND DISCUSSION

The results indicate that Socio-Technical Systems significantly enhance employee performance. This is evident from high mean scores on STS-related items such as technology availability and connectivity. Employee performance scores were also high, especially in timely task completion.

Workload had a significant individual effect but did not moderate the relationship between STS and performance. Despite perceptions of multitasking and increased responsibilities, employees maintained high performance levels, likely supported by technological tools.

These findings confirm STS theory and JD-R theory assertions that aligning technology with human resources can sustain performance even under pressure. However, extreme workload levels may still pose risks if unmitigated over time.

Descriptive Analysis Test

Table 1 Result of Descriptive Analysis of Socio-Technical System Variable

Code	Question Items	Mean	Criteria	Std. Dev
STS1	There are different technological tools that assure others can contact me quickly and easily.	4.84	Very High	0.428
STS2	My responsibilities force me to continually use available technological tools (cell phone, email, chat, video conferencing).	4.80	Very High	0.509
STS3	I have downloaded work-related applications on my personal mobile devices.	4.82	Very High	0.495
STS4	It is expected that I will always be connected to work issues beyond my workday.	4.52	Very High	0.664
STS5	They contact me about work issues after my workday through my available mobile devices.	3.93	High	0.950
Average Total		4.58	Very High	0.609

Source: SPSS, processed 2025

Table 2 Result of Descriptive Analysis of Workload Variable

Code	Question Items	Mean	Criteria	Std. Dev
W1	It is increasingly rare to have enough time for work tasks.	2.68	Enough	1.157
W2	It is increasingly hard to take time for breaks.	2.55	Low	1.130
W3	The time between the more intense work phases has decreased.	2.73	Enough	1.107
W4	One has to do two or three things at once (such as eating lunch, writing emails, and talking on the phone) more often.	3.50	High	1.229
W5	A growing amount of work has to be completed by fewer and fewer employees.	3.50	High	1.229
Average Total		3.00	Enough	1.17

Source: SPSS, processed 2025

Table 3 Result of Descriptive Analysis of Employee Performance Variable

Code	Question Items	Mean	Criteria	Std. Dev
EP1	I consistently arrive at work on time.	3.50	High	1.229
EP2	The results of my work do not disappoint other people	4.52	Very High	0.664
EP3	I always do my assignments on time	4.84	Very High	0.428
EP4	I really pay attention to various things related to tasks so that my work runs smoothly	3.93	High	0.950
EP5	I actively help my colleagues when they need assistance.	3.93	High	0.950
EP6	I am able to see everything as a whole and able to use the information obtained to determine priorities, anticipate and evaluate	3.93	High	0.950
EP7	I often guide or support my colleagues when needed.	3.50	High	1.229
EP8	I don't need to be supervised when doing my work.	3.41	High	0.972
Average Total		3.94	Very High	0.92

Source: SPSS, processed 2025

Based on Table 1, Table 2, and Table 3 of the descriptive analysis, the results of these tests are as follows:

1. Socio-Technical System

The Socio-Technical Systems variable received a very high average score of 4.58, indicating strong availability and use of digital tools among employees. The highest-rated item (4.84) showed that employees can be easily contacted via various technologies, while the lowest (3.93) reflected after-hours work communication.

2. Workload

The Workload variable had an average score of 3.00, falling into the “enough” category. Employees reported often multitasking and facing staff shortages (mean 3.50), while the lowest score (2.55) showed difficulty in taking breaks, suggesting a moderate workload level.

3. Employee Performance

The Employee Performance variable showed a very high average score of 3.94, reflecting strong work performance. The highest-rated item (4.84) was timely task completion, while the lowest (3.41) indicated that some employees still prefer some degree of supervision. Overall, employees demonstrated high motivation and good work ethics.

Data Quality Test Result

1. Validity Test

The criteria of the validity test If the Rcount > Rtable, the item is **valid**.

Table 4. Socio-Technical System Validity Test Result

No	STS	Rcount	Rtable	Information
1.	STS1	0.738	0.2973	Valid
2.	STS2	0.886	0.2973	Valid
3.	STS3	0.814	0.2973	Valid
4.	STS4	0.762	0.2973	Valid
5.	STS5	0.731	0.2973	Valid

Source: SPSS, processed 2025

Table 5. Workload Validity Test Result

No	W	Rcount	Rtable	Information
1.	W1	0.844	0.2973	Valid
2.	W2	0.841	0.2973	Valid
3.	W3	0.847	0.2973	Valid
4.	W4	0.816	0.2973	Valid
5.	W5	0.816	0.2973	Valid

Source: SPSS, processed 2025

Table 6. Employee Performance Validity Test Result

No	EP	Rcount	Rtable	Information
1.	EP1	0.570	0.2973	Valid
2.	EP2	0.525	0.2973	Valid
3.	EP3	0.407	0.2973	Valid
4.	EP4	0.760	0.2973	Valid
5.	EP5	0.760	0.2973	Valid
6.	EP6	0.760	0.2973	Valid
7.	EP7	0.570	0.2973	Valid
8.	EP8	0.589	0.2973	Valid

Source: SPSS, processed 2025

2. Reliability Test

The criteria of the realibility test If Cronbach Alpha is > 0.60 . The results of questionnaire reliability

Table 7. Result of Realibility Test

Variable	Coefficient Cronbach Alpha	Critical Value	Information
Socio – Technical Systems	0.802	0.60	Reliable
Workload	0.888	0.60	Reliable
Employee Performance	0.759	0.60	Reliable

Source: SPSS, processed 2025

Classical Assumption Test Results

1. Normality Test

using the Kolmogorov-Smirnov, if the values > 0.05 , the data distributed normal

Table 8. Result of Data Normality Test

No.	Variable	Kolmogorov Smirnov Values	Information
1.	Standardized Residuals	0.200	Normal Distribution

Source: SPSS, processed 2025

2. Multicollinearity

If the Tolerance value > 0.1 , multicollinearity is not present.
 If the VIF (Variance Inflation Factor) value < 10 , multicollinearity is not present

Table 9. Result of Multicollinearity Test

No.	Variable	Collinearity Statistics		Information
		Tolerance	VIF	
1.	Socio-Technical Systems	0.993	1.007	No Multicollinearity
2.	Workload	0.993	1.007	No Multicollinearity

Source: SPSS, processed 2025

3. Heteroscedasticity Test

If the significance value (Sig.) > 0.05, there is no indication of heteroscedasticity.

Table 10 Result of Heteroscedasticity Test

Variable	Sig.	Sig.Count	Information
Socio-Technical System	0.05	0.327	No Heteroscedasticity
Workload	0.05	0.627	No Heteroscedasticity

Source: SPSS, processed 2025

4. Linearity Test

If the Sig. value > 0.05, it indicates a significant linear relationship.

Table 11 Result of Linearity Test

Variable	Sig.	Sig.Count	Information
Socio-Technical System	0.05	0.092	Linear
Workload	0.05	0.330	Linear

Source: SPSS, processed 2025

Hypothesis Testing

Table 12 Result of Hypothesis Testing with MRA

Model	Unstandardized Coefficients		Standardized Coefficient Beta	t	Sig.
	B	Std. Error			
STS → Employee Performance	1.310	0.136	0.669	9.631	0.000
Workload → Performance	0.521	0.082	0.544	6.318	0.000
STS, Workload, STS× Workload → Performance	0.004	0.049	0.007	0.085	0.932

Source: SPSS, processed 2025

1. STS → Employee Performance

The STS variable has a positive and significant effect on employee performance, with a coefficient of $B = 1.310$, $t = 9.631$, and $\text{Sig.} = 0.000$ (< 0.05). This means that higher implementation of socio-technical systems significantly improves employee performance. The standardized beta coefficient of 0.669 shows a strong influence.

2. Workload → Employee Performance

The workload variable also shows a positive and significant effect on employee performance, with $B = 0.521$, $t = 6.318$, and $\text{Sig.} = 0.000$ (< 0.05). This indicates that even though workload increases, it may still be perceived as a challenge that motivates employees to perform better, up to a certain threshold. The beta value of 0.544 suggests a moderate effect size.

3. Interaction STS × Workload → Employee Performance

The interaction effect between STS and workload is not significant, with $B = 0.004$, $t = 0.085$, and $\text{Sig.} = 0.932$ (> 0.05). This implies that workload does not moderate the relationship between socio-technical systems and employee performance. In other words, regardless of workload level, the positive effect of STS on performance remains stable and is not influenced by the level of workload.

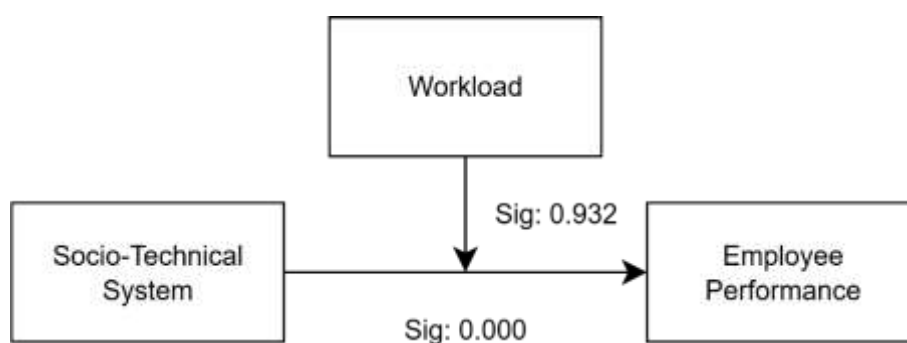


Figure 1. Research Model with Result of MRA

Figure 1 shows the tested research model. The Socio-Technical System has a significant positive effect on Employee Performance ($\text{Sig.} = 0.000$), meaning better implementation of socio-technical systems leads to improved performance. However, the Workload variable does not significantly moderate the relationship between Socio- Technical System and Employee Performance ($\text{Sig.} = 0.932$), indicating that the impact of STS on performance remains consistent regardless of workload level.

CONCLUSION

This research confirms that socio-technical systems positively impact employee performance, especially within public organizations experiencing high workloads. Although workload was found to have a significant effect individually, it did not moderate the STS- performance relationship.

Practical implications include strengthening the alignment between technological tools and human capacities to mitigate stress and enhance productivity. Limitations involve the sample size and focus on a single institution. Future research should explore cross-institutional comparisons and include qualitative methods. Based on the explanation we can confirm that hypothesis 1 accepted and hypothesis 2 rejected.

Implication

The findings show that Socio-Technical Systems (STS) positively impact employee performance. For DJPb, this means improving digital tools, communication systems, and providing training can boost productivity—even under high workload. Rather than only reducing workload, focusing on better systems and employee support will enhance performance.

Limitations

The number of respondents in this study did not reach the targeted 68 employees. This was partly due to the short time frame and the use of online questionnaire distribution, which limited the

response rate. Future research should allow more time and consider alternative or mixed methods for data collection to improve participation.

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