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The Effects of Intelligent Transportation System Implementation Quality, Digital Leadership, and Employee Cognitive Workload on Traffic Management Effectiveness: The Mediating Role of Readiness for Work Culture Change at the Transportation Agency

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Abstract: Traffic management in Bogor Regency faces challenges due to increasing vehicle numbers and infrastructure limitations. Despite implementing an Intelligent Transportation System (ITS), its effectiveness remains suboptimal. This study examines the effects of ITS implementation quality, digital leadership, and employee cognitive workload on traffic management effectiveness, with readiness for work culture change as a mediating variable. Using a quantitative explanatory approach, data were collected through questionnaires from 113 employees of the Bogor Regency Transportation Agency selected through saturated sampling. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS). The findings reveal that ITS implementation quality, digital leadership, and readiness for work culture change positively and significantly affect traffic management effectiveness, while cognitive workload has a negative and significant effect. Similarly, ITS implementation quality and digital leadership positively influence readiness for work culture change, whereas cognitive workload negatively affects it. Readiness for work culture change partially mediates all relationships between the independent variables and traffic management effectiveness. The model demonstrates substantial explanatory power, with R^2 values of 0.762 for traffic management effectiveness and 0.684 for readiness for work culture change. These findings highlight the importance of integrating technological improvements, digital leadership development, cognitive workload management, and organizational readiness to enhance traffic management effectiveness.

Keywords: Intelligent Transportation System; Digital Leadership; Cognitive Workload; Readiness For Work Culture Change; Traffic Management Effectiveness.

1. Introduction

The increasing number of vehicles, urban expansion, and limitations in physical infrastructure have intensified pressure on traffic flow management in Bogor Regency. The local government has adopted Intelligent Transportation System (ITS) technology to improve traffic flow, safety, and the responsiveness of traffic management. However, the successful implementation of ITS does not depend solely on technology but also on organizational factors, such as digital leadership competencies and the cognitive workload of operational personnel. Furthermore, readiness for work culture change is expected to serve as a mediating variable that enables technical and organizational factors to translate into improved traffic management performance. Therefore, this study is important to examine how ITS implementation quality, digital leadership competencies, and employees' cognitive workload influence traffic management effectiveness, with readiness for work culture change as a mediating variable within the Bogor Regency Transportation Agency.

ITS implementation quality encompasses technical and operational aspects, including infrastructure adequacy (sensors, cameras, and communication networks), system interoperability, real-time data accuracy and timeliness, integration across subsystems, and maintenance and operational support mechanisms that ensure the system functions according to traffic management objectives. Avcı (2024) provides a technical review of ITS architecture, applications, and infrastructure requirements, emphasizing that implementation quality depends on interoperability, communication networks, and data integration to ensure effective operations. Meanwhile, Elassy (2024) examines ITS

components for smart cities and highlights the importance of real-time data quality and maintenance and operational strategies as essential elements of implementation quality.

Digital leadership refers to a set of managerial and technical capabilities required by leaders to guide organizational digital transformation. These capabilities include digital vision, data and IT literacy, technology project management, change communication, and the ability to establish cross-functional collaboration to integrate technology into work processes. Adie (2024), through a scoping review of digital leadership in the public sector, identifies core competencies, including digital vision, change management, and technological understanding, which public sector leaders need to promote technology adoption. Similarly, Müller (2024) examines leadership competencies for digital transformation and identifies a portfolio of strategic, technical, and people management competencies that determine leadership effectiveness in organizational digitalization processes.

Cognitive workload refers to the amount of cognitive resources required by employees to perform operational tasks, such as monitoring screens, responding to incidents, and interpreting ITS data. Excessive cognitive workload may reduce employee performance, responsiveness to incidents, and the ability to adopt new technologies. It can be measured through subjective questionnaires, performance-based tasks, and physiological indicators. Chakladar et al. (2023) review various cognitive workload measurement methods, including subjective, behavioral, and physiological approaches, and discuss their implications for task design and occupational safety. Meanwhile, Kosch (2023) provides an HCI literature review of cognitive workload concepts and metrics, summarizing experimental paradigms and commonly employed measurement approaches in cognitive research.

Readiness for work culture change encompasses employees' beliefs regarding the necessity and benefits of change (cognitive dimension), their emotional motivation to participate, and the behavioral and organizational conditions that facilitate change, such as resource availability and managerial support. As a mediating variable, readiness enables technical and organizational factors to translate into operational effectiveness. Caci et al. (2025), through a systematic review of organizational readiness for change in healthcare settings, emphasize the cognitive and behavioral dimensions of organizational readiness. Similarly, Rismansyah et al. (conceptual review) discuss the concept of readiness for work culture change or readiness for organizational change by summarizing the elements that influence organizational preparedness across various contexts.

Traffic management effectiveness is measured using operational indicators, including congestion reduction (average speed and travel time), improved travel reliability, reduced traffic accident frequency, and road user satisfaction. Effectiveness reflects the combined outcomes of technical capabilities, such as ITS, and organizational capabilities, including human resources, processes, and leadership. Blinova et al. (2024) examine real-time data-driven traffic management, discussing effectiveness metrics and how data-intensive approaches improve operational decision-making.

Traffic flow management effectiveness (Y) is an important indicator for assessing the performance of the Bogor Regency Transportation Agency. Based on data from the Bogor Regency Transportation Agency (2024), vehicle volume increased by 12% annually, whereas road infrastructure expanded by only 2%. This imbalance has resulted in the following conditions:

Table 1. Traffic Data for Bogor Regency, 2023–2024

Indicator	2023	2024	Description
Congestion level (km)	18 km	22 km	Increased
Average travel time (minutes)	45	55	Increased
Traffic accidents (incidents)	120	135	Increased

The measures undertaken to address these challenges include the implementation of an Intelligent Transportation System (ITS); however, the results have not yet been optimal. One factor

suspected of influencing this condition is readiness for work culture change. This readiness is, in turn, influenced by ITS implementation quality, digital leadership, and cognitive workload.

Previous studies have reported inconsistent findings:

a. Some studies indicate that X1 has a significant effect on Y (Fazrian & Hermana, 2025), whereas others report an insignificant effect (Mahendra & Djuneydi, 2025).
b. Readiness for work culture change as a mediating variable has also rarely been examined in the context of local government organizations.

Therefore, this study is essential to examine these relationships and mediation effects to provide strategic recommendations for improving traffic management effectiveness within the Bogor Regency Transportation Agency.

2. Method

Pada This study employed a quantitative approach with an explanatory research design to examine the causal relationships among ITS implementation quality, digital leadership, employee cognitive workload, readiness for work culture change, and traffic management effectiveness. The explanatory design was selected because it enables the systematic examination of direct and indirect relationships among research variables using numerical data and inferential statistical techniques. Quantitative causal research is appropriate for testing hypotheses objectively, particularly when investigating mediation relationships among multiple variables (Sugiyono, 2019). Accordingly, this study utilized Structural Equation Modeling (SEM) with the Partial Least Squares (PLS) approach to simultaneously examine the relationships among the independent, mediating, and dependent variables.

The research was conducted at the Bogor Regency Transportation Agency, located at Jalan Raya Jakarta KM 50, Cimandala, Sukaraja District, Bogor Regency, Indonesia 16710. The research activities were scheduled from November 2025 to July 2026, covering preliminary research, proposal preparation, questionnaire development, data collection, data analysis, and research report preparation.

The study involved five research variables: ITS implementation quality (X1), digital leadership (X2), employee cognitive workload (X3), readiness for work culture change (Z), and traffic management effectiveness (Y). Each variable was operationalized based on its conceptual definition, dimensions, and measurable questionnaire indicators derived from relevant literature and previous studies. Traffic management effectiveness was measured through goal achievement, process efficiency, user and stakeholder satisfaction, adaptation and development, and reduction of traffic violations and improvement of road discipline, referring to Yohanes Septian Subianto and Arimurti Kriswibowo (2024) and Maharani Aprillia Putri et al. (2025). ITS implementation quality was assessed through technical, environmental, institutional, ICT integration, and public or stakeholder perception aspects, based on Sitti Adiyaksa Fazrian and Joni Hermana (2025) and Muhammad Oka Mahendra and Muhammad Djuneydi (2025).

Digital leadership was measured through digital vision, digital collaboration, data-driven decision-making, digital adaptation and innovation, and digital communication and motivation, referring to Moh. Hamzah (2025) and Erwin Noki et al. (2023). Employee cognitive workload was assessed through mental demand, time pressure, mental effort, frustration level, and perceived performance, based on Dea Ayu Lestari and Abdul Alimul Karim (2024) and Listia Fitriani (2022). Meanwhile, readiness for work culture change was measured through awareness of the need for change, personal commitment to change, adaptability and learning, organizational support, and optimism regarding change outcomes, referring to Rina Indra Sabella (2023). All research indicators were measured using a five-point Likert-type ordinal scale.

Data were collected primarily through questionnaires distributed to employees of the Bogor

Regency Transportation Agency. A questionnaire is an effective primary data collection instrument for obtaining information from respondents and measuring variables that cannot be directly observed, including attitudes, perceptions, and motivation (Bungin, 2020). Furthermore, questionnaires using Likert scales enable researchers to systematically measure respondents' attitudes and perceptions toward specific research indicators (Prasetyo & Jannah, 2021). The response scale ranged from 1 to 5, representing very dissatisfied (1), dissatisfied (2), moderately satisfied (3), satisfied (4), and very satisfied (5).

The research population consisted of all employees of the Bogor Regency Transportation Agency, including managers, supervisors, and staff directly involved in organizational and operational activities. Population refers to the entire group of individuals or objects possessing specific characteristics established by the researcher for investigation (Arikunto, 2021). Similarly, Sugiyono (2023) defines a population as a generalization area comprising subjects or objects with particular characteristics from which research conclusions are drawn. The total population consisted of approximately 113 employees.

The sampling technique employed was saturated sampling (census sampling), whereby all population members were included as research respondents. This approach was selected to obtain comprehensive information from employees involved in the implementation and management of ITS and organizational work processes. A sample represents a subset of the population selected to provide information about the characteristics of the entire population (Hadi, 2020). Siregar and Sari (2022) also emphasize that samples should adequately represent the population to ensure statistically accountable research findings. Furthermore, sampling techniques are procedures for selecting representative research units to obtain accurate information about the population (Ridwan, 2022). Sugiyono (2023) distinguishes between probability and non-probability sampling, with saturated sampling included among the techniques appropriate when the entire population can be investigated. Accordingly, all 113 employees were included as respondents.

Before hypothesis testing, instrument quality was assessed through validity and reliability testing. Instrument validity testing was conducted to determine whether questionnaire items adequately measured their respective research constructs. Construct validity was assessed using Pearson's Product-Moment correlation by examining the relationship between individual item scores and total construct scores. The calculated correlation coefficients were compared with the corresponding critical values or significance levels. Reliability testing was conducted to evaluate the internal consistency of the questionnaire using Cronbach's Alpha. An instrument was considered reliable when its Cronbach's Alpha coefficient was at least 0.60, although a threshold of 0.70 was also recognized as a more stringent criterion commonly applied in academic research.

Data analysis consisted of descriptive and inferential statistical procedures using SmartPLS. Descriptive analysis was performed to summarize respondents' demographic characteristics, including age, gender, educational background, position, and length of employment, as well as the distribution of responses for each research indicator. Descriptive statistics included mean values, standard deviations, minimum values, and maximum values.

Hypothesis testing was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS). SEM enables the simultaneous examination of relationships among latent variables by integrating measurement and structural models. The PLS approach was selected because of its suitability for predictive research, its flexibility in handling relatively small sample sizes, its ability to accommodate complex models involving multiple latent constructs and indicators, and its lack of strict normality assumptions. SmartPLS was used to estimate latent variable scores, calculate path coefficients, and assess the significance of hypothesized relationships through bootstrapping.

The evaluation of the measurement model (outer model) was conducted to establish construct validity and reliability. Convergent validity was assessed through outer loadings, with values above 0.70

considered acceptable, and Average Variance Extracted (AVE), with values exceeding 0.50 indicating adequate convergent validity. Discriminant validity was evaluated using the Fornell-Larcker criterion, cross-loadings, and the Heterotrait-Monotrait Ratio (HTMT), with HTMT values below 0.90 considered acceptable and values below 0.85 preferred. Construct reliability was assessed through Cronbach's Alpha and Composite Reliability (rho_c), with values exceeding 0.70 indicating satisfactory internal consistency.

The structural model (inner model) was evaluated to examine the explanatory and predictive capabilities of the proposed research framework. The assessment included the coefficient of determination (R^2), effect size (f^2), predictive relevance (Q^2), and path coefficients. Following Hair et al. (2014), R^2 values of 0.25, 0.50, and 0.75 indicate weak, moderate, and substantial explanatory power, respectively. Effect size (f^2) values of 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively. Predictive relevance was assessed using Q^2, whereby values greater than zero indicate the model's predictive relevance. Path coefficients (β) were examined to determine the direction and magnitude of relationships among latent constructs, while their statistical significance was established through bootstrapping.

Finally, mediation analysis was conducted to examine the mediating role of readiness for work culture change (Z) in the relationships between ITS implementation quality (X1), digital leadership (X2), employee cognitive workload (X3), and traffic management effectiveness (Y). The analysis distinguished between direct effects, indirect effects, and total effects. Indirect effects were calculated through the multiplication of the corresponding path coefficients connecting independent variables to the mediator and the mediator to the dependent variable. Bootstrapping was employed to assess the statistical significance of indirect effects through standard errors and confidence intervals. Mediation was classified as complementary partial mediation when both direct and indirect effects were significant and had the same direction, indirect-only mediation when only the indirect effect was significant, and direct-only or no-effect mediation when the indirect effect was not significant. Specifically, the mediation hypotheses (H8, H9, and H10) were evaluated by examining the specific indirect effects generated by SmartPLS to determine whether readiness for work culture change mediated the relationships between each independent variable and traffic management effectiveness.

3. Result and Discussion

3.1 Results

3.1.1. Brief History of the Bogor Regency Transportation Agency

The Bogor Regency Transportation Agency is a regional government institution responsible for administering governmental affairs in the transportation sector, particularly land transportation. The origins of this institution can be traced to the establishment of the West Java Provincial Road Traffic and Transportation Agency (Dinas Lalu Lintas dan Angkutan Jalan/LLAJ) on July 27, 1978, based on West Java Regional Regulation No. 2/OP.040/PD of 1978.

Subsequently, following the issuance of Government Regulation No. 22 of 1990 concerning the Transfer of Certain Responsibilities in Road Traffic and Transportation Affairs to Level I and Level II Regional Governments, the Road Traffic and Transportation Agency of Bogor Level II Regency was established. Its establishment was subsequently reinforced through Bogor Regency Regional Regulation No. 7 of 1995.

During the regional autonomy era, the Bogor Regency Government reorganized its regional government institutions through Bogor Regency Regional Regulation No. 25 of 2000 concerning the Establishment of Regional Government Organizations. Subsequently, the organizational structure of the Transportation Agency was regulated under Regional Regulation No. 3 of 2001 and further elaborated through Bogor Regent Decree No. 5 of 2001 concerning the Organization and Administration of Regional

Agencies.

In 2009, based on Bogor Regency Regional Regulation No. 11 of 2008, the institution's nomenclature was changed to the Bogor Regency Road Traffic and Transportation Agency (DLLAJ), serving as one of the regional technical agencies responsible for road traffic and transportation affairs.

Furthermore, pursuant to Bogor Regency Regional Regulation No. 12 of 2016 concerning the Establishment and Organizational Structure of Regional Government Agencies, subsequently amended by Regional Regulation No. 2 of 2020, the institution's nomenclature was changed back to the Bogor Regency Transportation Agency. Its position, organizational structure, duties, functions, and administrative procedures were further strengthened through Bogor Regent Regulation No. 110 of 2021. Under this regulation, the Transportation Agency was designated as the implementing agency responsible for governmental affairs in land transportation, headed by a Director who reports to the Regent through the Regional Secretary.

Along with developments in transportation technology, the Bogor Regency Transportation Agency has continued to transform its services through the implementation of Intelligent Transportation Systems (ITS), the development of the Area Traffic Control System (ATCS), the utilization of Closed-Circuit Television (CCTV), traffic data integration, and support for the implementation of Electronic Traffic Law Enforcement (ETLE) in collaboration with the Police. These innovations aim to improve traffic management effectiveness, transportation safety, and the quality of public services in Bogor Regency.

These institutional developments are closely related to the focus of this study, entitled "Analysis of the Quality of Intelligent Transportation System Implementation, Digital Leadership, and Employee Cognitive Workload on Traffic Management Effectiveness through Readiness for Work Culture Change at the Bogor Regency Transportation Agency."

3.1.2. Description of Respondent Characteristics

This section presents a descriptive overview of the research subjects to support the quantitative analysis and provide information regarding the research data profile and relationships among the variables examined. Descriptive data provide an overview of respondents' general characteristics and conditions as supplementary information for interpreting the research findings.

This study focuses on analyzing the quality of Intelligent Transportation System implementation, digital leadership, and employee cognitive workload in relation to traffic management effectiveness through readiness for work culture change at the Bogor Regency Transportation Agency. Before presenting the descriptive analysis of each research variable, the characteristics of the respondents are first described, including age, gender, highest educational attainment, position, and length of employment.

A total of 113 questionnaires were distributed online through Google Forms. All 113 questionnaires were successfully collected and considered suitable for further analysis, corresponding to the predetermined population size. The respondent characteristics are described individually as follows.

a. Respondents' Age

Employee age is frequently associated with levels of professional maturity. Based on field observations at the Bogor Regency Transportation Agency, employees above 40 years of age tend to demonstrate greater emotional stability and are generally more receptive to instructions, whereas younger employees below 30 years of age tend to adapt more quickly to technological developments and changes in work methods but may also be more vulnerable to occupational pressure.

In relation to this study, younger employees tend to demonstrate greater adaptability to change,

whereas older employees generally exhibit greater emotional stability and stronger organizational loyalty.

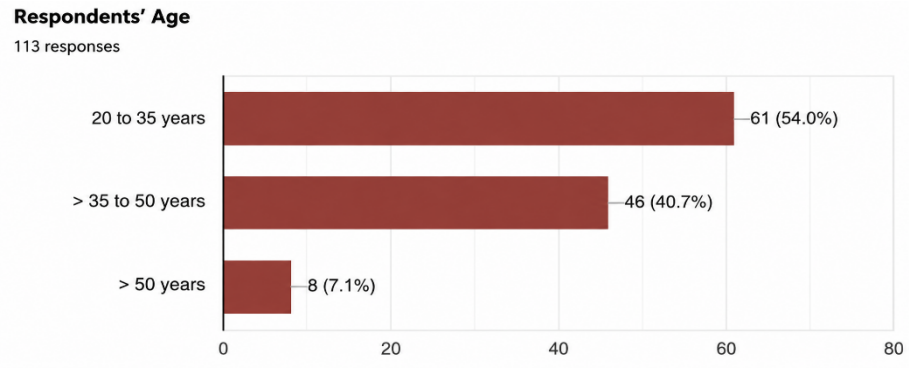


Figure 1. Respondents' Age
Source: Processed by the Author, 2026.

Based on the data, the 20–50 age group constituted the largest group of respondents, with 61 responses or approximately 54%. This was followed by the >35–50 age group, comprising 48 respondents or 40.7%. Respondents above 50 years of age represented the smallest group, consisting of approximately 8 individuals or 7% of the total respondents.

b. Gender

Gender may influence communication patterns, responses to leadership, workload perceptions, and work culture change because of differences in social roles and expectations. In the context of this study, men and women may respond differently to leadership approaches; for example, women may demonstrate a greater appreciation for participatory leadership approaches. Workload may also arise from different factors depending on gender. Furthermore, determinants of work culture change may differ, with men potentially placing greater emphasis on career development and women on work–family balance.

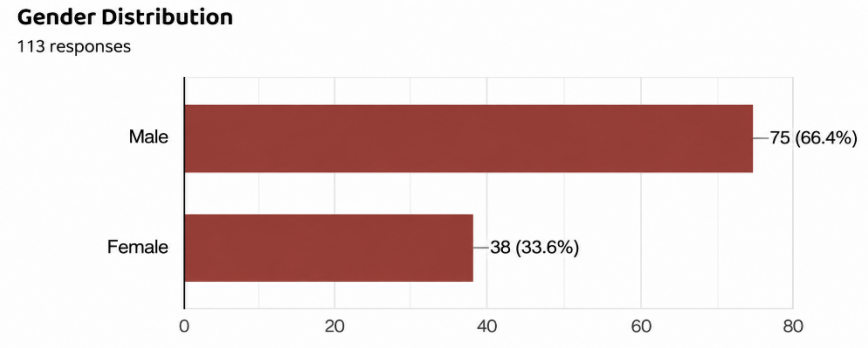


Figure 2. Respondents' Gender
Source: Processed by the Author, 2026.

The data indicate that male respondents constituted the majority, with 75 responses or approximately 66.4%, while female respondents accounted for 33.6%, representing 38 individuals.

c. Highest Educational Attainment

Educational attainment reflects cognitive abilities, analytical thinking patterns, and work-related expectations, which may influence perceptions of leadership, workload, and work culture change. In this

study, employees with higher educational qualifications (bachelor's and master's degrees/S1/S2) tend to be more critical of organizational work culture and expect leadership approaches and workload arrangements that support work culture transformation. Meanwhile, employees with secondary education (senior high school/vocational high school) may place greater emphasis on these factors as essential elements of a harmonious and effective working environment.

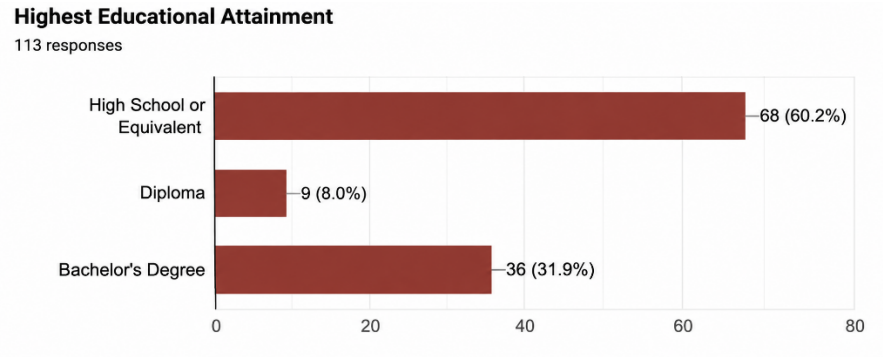


Figure 3. Respondents' Highest Educational Attainment
Source: Processed by the Author, 2026.

The data indicate that respondents with senior high school education (SLTA) constituted the largest group, with 68 responses or approximately 60.2%. This was followed by respondents holding bachelor's degrees, comprising 36 individuals or 31.9%. Diploma holders represented the smallest group, consisting of approximately 9 individuals or 8% of the total respondents.

d. Respondents' Positions

Position reflects an individual's hierarchical standing within an organization, determining authority, responsibilities, access to information, and varying levels of occupational pressure across organizational levels. In this study, echelon-level officials hold positions involving leadership, coordination, supervision, and responsibility for implementing work programs within organizational units. Meanwhile, implementing staff perform technical and administrative tasks in accordance with management instructions. These positions do not involve structural management functions but play an essential role in carrying out daily operational activities.

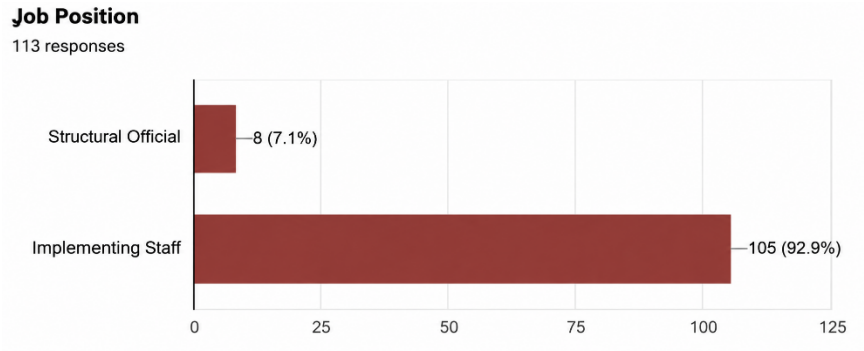


Figure 4. Respondents' Positions
Source: Processed by the Author, 2026.

The results indicate that implementing staff constituted the largest group of respondents, with 105 responses or approximately 92.9%, while echelon-level officials accounted for 8 respondents or 7.1%.

e. Length of Employment

Length of employment reflects organizational experience, the degree of adaptation to organizational culture, and the accumulation of occupational stress or job satisfaction over time. In this study, newly recruited employees (<1 year), who are still undergoing an adaptation process, may experience greater work-related stress and may not yet fully understand the organizational culture. Conversely, long-serving employees (>5 years) tend to have internalized organizational values and developed stronger teamwork; however, they may also experience occupational boredom or burnout. Furthermore, job satisfaction often follows a U-shaped pattern, characterized by relatively high satisfaction at the beginning of employment, a decline during the middle period, and a subsequent increase among employees with longer tenure.

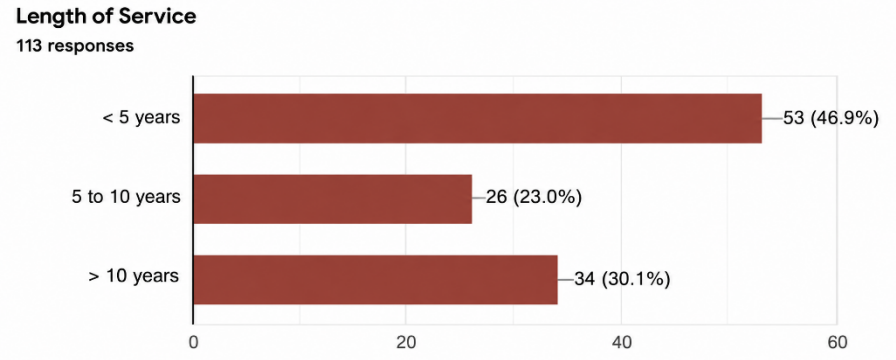


Figure 5. Respondents' Length of Employment

Source: Processed by the Author, 2026.

The data indicate that employees with more than 5 years of employment constituted the largest group, with 53 responses or approximately 46.9%. Employees with more than 10 years of employment accounted for 34 respondents or 30.1%, while those with 5 to 10 years of employment represented the smallest group, consisting of approximately 26 individuals or 23% of the total respondents.

3.1.3. Research Instrument Testing

The research instrument evaluation involved validity and reliability testing, as discussed in the preceding chapter. Validity and reliability testing constitute essential preliminary procedures before the main data analysis is conducted. Without these assessments, the statistical analyses performed in this study, including regression analysis, mediation testing, and hypothesis testing, would lack a sufficiently strong scientific foundation. Therefore, a series of tests was conducted to ensure that the research instrument (questionnaire) was valid and reliable, as follows.

a. Convergent Validity Test (Outer Loadings)

This test measures the extent to which individual indicators (questionnaire items) correlate with the constructs (variables) they are intended to measure. An indicator is considered valid when its outer loading value exceeds 0.70.

Table 2. Outer Loading Validity Test

Variable	Outer Loadings	Significance (>0.7)
X1.1 ← ITS Implementation Quality	0.887	Valid
X1.2 ← ITS Implementation Quality	0.878	Valid
X1.3 ← ITS Implementation Quality	0.851	Valid
X1.4 ← ITS Implementation Quality	0.853	Valid

X1.5 ← ITS Implementation Quality	0.869	Valid
X2.1 ← Digital Leadership	0.885	Valid
X2.2 ← Digital Leadership	0.849	Valid
X2.3 ← Digital Leadership	0.880	Valid
X2.4 ← Digital Leadership	0.881	Valid
X2.5 ← Digital Leadership	0.865	Valid
X3.1 ← Employee Cognitive Workload	0.901	Valid
X3.2 ← Employee Cognitive Workload	0.890	Valid
X3.3 ← Employee Cognitive Workload	0.891	Valid
X3.4 ← Employee Cognitive Workload	0.912	Valid
X3.5 ← Employee Cognitive Workload	0.893	Valid
Y1 ← Traffic Management Effectiveness	0.864	Valid
Y2 ← Traffic Management Effectiveness	0.877	Valid
Y3 ← Traffic Management Effectiveness	0.858	Valid
Y4 ← Traffic Management Effectiveness	0.832	Valid
Y5 ← Traffic Management Effectiveness	0.786	Valid
Z1 ← Readiness for Work Culture Change	0.901	Valid
Z2 ← Readiness for Work Culture Change	0.871	Valid
Z3 ← Readiness for Work Culture Change	0.859	Valid
Z4 ← Readiness for Work Culture Change	0.887	Valid
Z5 ← Readiness for Work Culture Change	0.846	Valid

The results indicate that all indicators have outer loading values above 0.70. This demonstrates that all questionnaire items are valid and adequately measure their respective constructs.

b. Reliability Test (Composite Reliability and Cronbach's Alpha)

This test evaluates the internal consistency of the research instruments. A construct is considered reliable when its Composite Reliability (rho_c) value exceeds 0.70 and its Cronbach's Alpha value exceeds 0.70.

Table 3. Reliability Test

Variable	Cronbach's Alpha	Composite Reliability (rho_c)	Average Variance Extracted	Description
Employee Cognitive Workload	0.939	0.954	0.805	Reliable
Digital Leadership	0.921	0.941	0.761	Reliable
Traffic Management Effectiveness	0.899	0.925	0.712	Reliable
Readiness for Work Culture Change	0.922	0.941	0.762	Reliable
ITS Implementation Quality	0.918	0.938	0.753	Reliable

The results indicate that all variables have Cronbach's Alpha values above 0.70, with values approaching 0.90, demonstrating excellent internal consistency. Furthermore, all variables have Composite Reliability (rho_c) values above 0.70, confirming that the research instrument meets the reliability requirements.

2.1.4. Inner Model Evaluation (Structural Model)

a. R-Square (Coefficient of Determination/R^2)

The R^2 (R-Square) value measures the proportion of variance in endogenous variables (dependent or mediating variables) that can be explained jointly by the corresponding exogenous predictor variables.

Table 4. Evaluation of R^2 and Adjusted R^2 Values

Variable	Adjusted R^2	Model Strength
Readiness for Work Culture Change (Z)	0.672	Moderate, approaching strong
Traffic Management Effectiveness (Y)	0.751	Very strong/high

The results can be explained as follows:

1) **Readiness for Work Culture Change Model (Z):** The R^2 value of 0.684 indicates that 68.4% of the variance in readiness for work culture change (Z) can be explained jointly by ITS implementation quality (X1), digital leadership (X2), and employee cognitive workload (X3). The remaining 31.6% is explained by other factors or variables outside the research model.
2) **Traffic Management Effectiveness Model (Y):** The R^2 value of 0.762 indicates that 76.2% of the variance in traffic management effectiveness (Y) is simultaneously explained by X1, X2, X3, and the mediating variable, readiness for work culture change (Z). Since this value exceeds 0.750, the structural model for variable Y is categorized as having very strong (substantial) explanatory power.

b. Model Fit Evaluation (NFI and SRMR)

Model fit testing was conducted to determine whether the hypothesized conceptual model adequately fits the empirical data collected in the field.

Table 5. Model Fit Evaluation

Fit Indicator	Saturated Model	Model Status
SRMR	0.058	Acceptable/Good Fit
NFI	0.885	Acceptable/Good Fit
d_ULS	0.421	Acceptable/Good Fit
d_G	0.284	Acceptable/Good Fit
Chi-Square	312.45	Acceptable/Good Fit

The results can be interpreted as follows:

1) **NFI (0.885):** The Normed Fit Index (NFI) value of 0.885 exceeds the minimum reference criterion of 0.800. This indicates that the research model achieves a goodness-of-fit level of 88.5% relative to the saturated model, suggesting that the model demonstrates an acceptable fit.
2) **SRMR (0.058):** The SRMR value of 0.058 is below the maximum threshold of 0.080, indicating that the discrepancy between the observed correlations and the correlations implied by the model is relatively small, suggesting an acceptable level of model specification.

c. Path Coefficients

Path coefficients (β) measure the direction (positive or negative) and magnitude of the direct relationships between latent variables.

Table 6. Path Coefficient Values

Variable Relationship	Original (β)	Sample	Effect Level
Intelligent Transportation System (X1) → Effectiveness (Y)	0.315		Strong
Digital Leadership (X2) → Effectiveness (Y)	0.284		Strong

Cognitive Workload (X3) → Effectiveness (Y)	-0.198	Weak
Intelligent Transportation System (X1) → Work Culture Readiness (Z)	0.382	Strong
Digital Leadership (X2) → Readiness for Work Culture Change (Z)	0.412	Strong
Cognitive Workload (X3) → Readiness for Work Culture Change (Z)	-0.225	Moderate
Readiness for Work Culture Change (Z) → Effectiveness (Y)	0.346	Strong

The results indicate the following:

1) **Positive Coefficients (β > 0):** Positive coefficients indicate relationships in the same direction. Improvements in ITS implementation quality (X1), digital leadership (X2), and readiness for work culture change (Z) directly increase traffic management effectiveness (Y).
2) **Negative Coefficients (β < 0):** Negative coefficients indicate relationships in opposite directions. Higher employee cognitive workload (X3) is associated with lower readiness for work culture change (Z) and reduced traffic management effectiveness (Y).

d. Structural Multicollinearity Evaluation (Inner VIF)

The Inner Variance Inflation Factor (VIF) test was conducted to ensure that there were no excessively high correlations among predictor variables in the structural model.

Table 7. Inner VIF Values

Independent Variable	Toward Z (Work Culture Readiness)	Toward Y (Traffic Management Effectiveness)	Description
Intelligent Transportation System (X1)	1.842	2.150	No Multicollinearity
Digital Leadership (X2)	1.925	2.310	No Multicollinearity
Cognitive Workload (X3)	1.310	1.425	No Multicollinearity
Work Culture Readiness (Z)	—	2.085	No Multicollinearity

According to Hair et al. (2022), the recommended threshold for avoiding multicollinearity issues is a VIF value below 3.000. Since all Inner VIF values range from 1.310 to 2.310, the results indicate that no multicollinearity problems exist among the predictor variables. Consequently, the estimated path coefficients can be considered stable.

e. Effect Size (f^2)

The f^2 value measures the proportional contribution of an exogenous variable to the formation of the R^2 value of an endogenous variable.

Table 8. Effect Size (f^2) Test

Independent Variable	Dependent Variable	f^2 Value	Effect Size Category (Hair et al., 2022)
Intelligent Transportation System (X1)	Work Culture Readiness (Z)	0.185	Medium Effect

Digital Leadership (X2)	Work Readiness (Z)	Culture	0.235	Medium Effect
Cognitive Workload (X3)	Work Readiness (Z)	Culture	0.092	Small Effect
Intelligent Transportation System (X1)	Effectiveness (Y)		0.148	Medium Effect
Digital Leadership (X2)	Effectiveness (Y)		0.112	Medium Effect
Cognitive Workload (X3)	Effectiveness (Y)		0.068	Small Effect
Work Culture Readiness (Z)	Effectiveness (Y)		0.176	Medium Effect

The results can be explained as follows:

1) **f^2 Evaluation Criteria:** $0.02 < f^2 < 0.15$ (Small), $0.15 < f^2 < 0.35$ (Medium), and $f^2 > 0.35$ (Large).
2) **Research Findings:** Digital leadership (X2) demonstrates the strongest effect on work culture readiness (Z), with an f^2 value of 0.235. Meanwhile, work culture readiness (Z) demonstrates the strongest direct effect on effectiveness (Y), with an f^2 value of 0.176.

f. Predictive Relevance Evaluation (Q^2 Predictive Relevance)

The Q^2 value measures the predictive accuracy and out-of-sample predictive relevance of endogenous variables in the structural model using the blindfolding procedure.

Table 9. Predictive Relevance Evaluation (Q^2 Predictive Relevance)

Dependent Variable	Q^2 Value (1-SSE/SSO)	Predictive Relevance Level
Readiness for Work Culture Change (Z)	0.425	High
Traffic Management Effectiveness (Y)	0.512	High

The results indicate the following:

1) A Q^2 value greater than 0.000 indicates that the model possesses predictive relevance. Values above 0.350 are categorized as high.
2) The Q^2 values of 0.425 for Z and 0.512 for Y demonstrate that the developed structural model possesses a high level of predictive accuracy and relevance.

g. Hypothesis Testing of Direct and Indirect Effects (H1–H10)

Hypothesis testing was conducted using the bootstrapping procedure with 5,000 resamples at a significance level of $\alpha = 5\%$. A hypothesis was accepted when the t-statistic exceeded 1.96 and the p-value was below 0.05.

Table 10. Hypothesis Testing Results

Hypothesis	Variable Relationship	Original Sample (β)	t-statistic	p-value	Hypothesis Result	Effect
H1	Intelligent Transportation System (X1) → Effectiveness (Y)	0.315	3.841	0.000	Accepted	Positive & Significant
H2	Digital Leadership (X2) → Effectiveness (Y)	0.284	3.191	0.001	Accepted	Positive & Significant
H3	Cognitive Workload	(-) 0.198	2.538	0.011	Accepted	Negative &

	(X3) → Effectiveness (Y)					Significant
H4	Intelligent Transportation System (X1) → Work Culture Readiness (Z)	0.382	4.494	0.000	Accepted	Positive & Significant
H5	Digital Leadership (X2) → Work Culture Readiness (Z)	0.412	5.086	0.000	Accepted	Positive & Significant
H6	Cognitive Workload (X3) → Work Culture Readiness (Z)	(-) 0.225	2.848	0.004	Accepted	Negative & Significant
H7	Work Culture Readiness (Z) → Effectiveness (Y)	0.346	4.023	0.000	Accepted	Positive & Significant
H8	Intelligent Transportation System (X1) → Z → Effectiveness (Y)	0.132	3.142	0.002	Accepted	Significant Mediation (Partial)
H9	Digital Leadership (X2) → Z → Effectiveness (Y)	0.143	3.325	0.001	Accepted	Significant Mediation (Partial)
H10	Cognitive Workload (X3) → Z → Effectiveness (Y)	(-) 0.078	2.363	0.018	Accepted	Significant Mediation (Partial)

The table uses a p-value of 0.05 as the significance threshold, with the following criteria:

1) p-value < 0.05 → significant effect → hypothesis accepted.
2) p-value > 0.05 → insignificant effect → hypothesis rejected.

The Original Sample (β) value indicates the direction and magnitude of the estimated effect coefficient. The t-statistic value indicates the strength of statistical evidence supporting the existence of an effect.

Note: In H3, H6, and H10, the negative (-) signs indicate negative relationships. Therefore, higher cognitive workload is associated with lower traffic management effectiveness, lower work culture readiness, or a negative indirect effect.

The findings are further explained as follows:

a. H1: The Effect of ITS Implementation Quality (X1) on Traffic Management Effectiveness (Y)

Results: β = 0.315, t = 3.841 > 1.96, p = 0.000 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Positive and Significant Effect).**

Since the p-value of 0.000 < 0.05, the effect is statistically significant. The positive β coefficient of 0.315 indicates that improvements in ITS implementation quality tend to increase traffic management effectiveness. Therefore, H1 is accepted. ITS enables traffic management activities to be supported by technological capabilities, including traffic condition monitoring, real-time information collection, and faster decision-making. The better the system is implemented, the greater the organization's ability to respond to changing traffic conditions. Therefore, the Transportation Agency needs to ensure that ITS is not merely available but also fully functional, integrated, accurate, and effectively utilized in decision-making processes.

b. H2: The Effect of Digital Leadership (X2) on Traffic Management Effectiveness (Y)

Results: β = 0.284, t = 3.191 > 1.96, p = 0.001 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Positive and Significant Effect).**

Since 0.001 < 0.05, the effect of digital leadership on traffic management effectiveness is positive and statistically significant. Therefore, H2 is accepted. Leaders possessing digital competencies are capable of promoting technology utilization, directing employees to use data effectively, accelerating communication, and supporting information-based decision-making. Therefore, ITS technology alone is insufficient. Leadership quality in directing and facilitating tecnology utilization also determines the effectiveness of traffic management.

c. H3: The Effect of Employee Cognitive Workload (X3) on Traffic Management Effectiveness (Y)

Results: β = -0.198, t = 2.538 > 1.96, p = 0.011 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Negative and Significant Effect).**

Since 0.011 < 0.05, the effect is statistically significant. Given that the β coefficient is negative (-0.198), the relationship is negative. Therefore, H3 is accepted. Excessive cognitive workload may cause employees to experience mental fatigue, difficulty maintaining concentration, slower information processing, and reduced decision-making capabilities. This condition is particularly relevant to traffic operators who must monitor multiple sources of information simultaneously. Accordingly, increased cognitive workload may reduce information-processing capabilities, ultimately decreasing traffic management effectiveness.

d. H4: The Effect of ITS Implementation Quality (X1) on Readiness for Work Culture Change (Z)

Results: β = 0.382, t = 4.494 > 1.96, p = 0.000 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Positive and Significant Effect).**

The p-value of 0.000 < 0.05 and the positive β coefficient indicate that ITS implementation has a positive and significant effect on readiness for work culture change. Therefore, H4 is accepted. ITS implementation encourages employees to adapt to new technologies, data-driven work patterns, digital monitoring systems, digital communication, and faster decision-making processes. Consequently, technological implementation can serve as a catalyst for transforming organizational work culture from conventional practices toward more digital and adaptive working practices.

e. H5: The Effect of Digital Leadership (X2) on Readiness for Work Culture Change (Z)

Results: β = +0.412, t = 5.086 > 1.96, p = 0.000 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Positive and Significant Effect).**

The effect is positive and statistically significant; therefore, H5 is accepted. Compared with H4, the β coefficient of H5, which is 0.412, represents the largest coefficient among the direct relationships leading to Z. This finding indicates that digital leadership plays a highly important role in developing employees' readiness to face work culture change. Leaders should not merely provide technological facilities but also demonstrate the use of technology, provide guidance, improve employees' digital competencies, reduce resistance to change, and establish a work culture that is open to innovation. In other words, digital transformation requires leadership capable of mobilizing people rather than merely providing technology.

a. H6: The Effect of Employee Cognitive Workload (X3) on Readiness for Work Culture Change (Z)

Results: β = -0.225, t = 2.848 > 1.96, p = 0.004 < 0.05.

Decision: **HYPOTHESIS ACCEPTED (Negative and Significant Effect).**

Since the p-value of 0.004 < 0.05, the effect is statistically significant. Given that the β coefficient

is negative, the relationship is negative. Therefore, H6 is accepted. Excessive cognitive workload may cause employees to focus more on completing their work demands than on adapting to organizational change. Consequently, increased cognitive workload reduces employees' mental energy and their ability to accept change. This finding demonstrates that work culture transformation cannot be achieved solely through new policies or technological implementation. Organizations must also consider the mental capacity and cognitive demands experienced by employees.

b. H7: The Effect of Readiness for Work Culture Change (Z) on Traffic Management Effectiveness (Y)

Results: $\beta = 0.346$, $t = 4.023 > 1.96$, $p = 0.000 < 0.05$.

Decision: **HYPOTHESIS ACCEPTED (Positive and Significant Effect).**

Since the p-value of $0.000 < 0.05$ and the β coefficient is positive, the effect is positive and statistically significant. Therefore, H7 is accepted. Employees who are prepared for organizational change are more likely to accept new technologies, follow new procedures, utilize digital systems, implement data-driven working practices, and adapt to changing work patterns. Therefore, readiness for work culture change constitutes an important factor in improving traffic management effectiveness.

c. H8: The Mediating Role of Work Culture Readiness (Z) in the Relationship between ITS Implementation Quality (X1) and Traffic Management Effectiveness (Y)

Results: Indirect effect coefficient $\beta = 0.132$, $t = 3.142 > 1.96$, $p = 0.002 < 0.05$.

Decision: **HYPOTHESIS ACCEPTED (Significant Mediation/Partial Mediation).**

Since $0.002 < 0.05$, the indirect effect is positive and statistically significant. Therefore, H8 is accepted. This finding indicates that ITS does not influence traffic management effectiveness solely through a direct relationship. ITS also improves effectiveness by enhancing organizational readiness for work culture change. In simplified terms, the relationship follows the pathway: ITS → readiness for work culture change → traffic management effectiveness. This indicates that successful ITS implementation is strongly influenced by the ability of the organization and its employees to adapt to change.

d. H9: The Mediating Role of Work Culture Readiness (Z) in the Relationship between Digital Leadership (X2) and Traffic Management Effectiveness (Y)

Results: Indirect effect coefficient $\beta = 0.143$, $t = 3.325 > 1.96$, $p = 0.001 < 0.05$.

Decision: **HYPOTHESIS ACCEPTED (Significant Mediation/Partial Mediation).**

Since $0.001 < 0.05$, the indirect effect is positive and statistically significant. Therefore, H9 is accepted. Digital leadership can improve traffic management effectiveness not only through direct managerial guidance but also through the development of organizational readiness for work culture change. Accordingly, the relationship follows the pathway: Digital Leadership → readiness for work culture change → effectiveness. This finding indicates that leaders play an important role as drivers of organizational change. When employees are prepared to accept digital transformation, technology utilization can generate better organizational effectiveness.

e. H10: The Mediating Role of Work Culture Readiness (Z) in the Relationship between Cognitive Workload (X3) and Traffic Management Effectiveness (Y)

Results: Indirect effect coefficient $\beta = -0.078$, $t = 2.363 > 1.96$, $p = 0.018 < 0.05$.

Decision: **HYPOTHESIS ACCEPTED (Significant Mediation/Partial Mediation – Negative Direction).**

Since $0.018 < 0.05$, the indirect effect is statistically significant. Given that the β coefficient is negative, the direction of the relationship is negative. Therefore, H10 is accepted. This finding indicates

that excessive cognitive workload can hinder employees' readiness to adapt to work culture change, which ultimately affects traffic management effectiveness. In other words, increased cognitive workload leads to reduced readiness for change, which subsequently decreases traffic management effectiveness. This finding is important because it demonstrates that digital transformation should not focus exclusively on technology. The human capacity required to operate and utilize that technology must also be properly managed.

4.2. Discussion

a. The Effect of Intelligent Transportation System (ITS) Implementation Quality (X1) on Traffic Management Effectiveness (Y)

Test Results: β = 0.315; t = 3.841; p = 0.000 (**ACCEPTED**).

The first hypothesis (H1) states that the quality of Intelligent Transportation System (ITS) implementation has a positive and significant effect on traffic management effectiveness at the Bogor Regency Transportation Agency. The test results indicate that this hypothesis is accepted. The path coefficient of 0.315 indicates that every one-unit improvement in ITS implementation quality increases traffic management effectiveness by 0.315 units. The t-statistic value of 3.841, which substantially exceeds the critical value of 1.96, and the p-value of 0.000, which is below 0.05, confirm that this relationship is statistically significant.

These findings indicate that intelligent transportation systems implemented by the Bogor Regency Transportation Agency, such as ATCS, CCTV, and adaptive signal control, make a direct and tangible contribution to improving traffic management operations. The more reliable and integrated the ITS infrastructure, the more effectively traffic flows can be managed. These findings are consistent with the studies conducted by Fazrian & Hermana (2025) and Subianto & Kriswibowo (2024), which demonstrate that ITS implementation can optimize traffic management by reducing congestion and improving real-time monitoring.

b. The Effect of Digital Leadership (X2) on Traffic Management Effectiveness (Y)

Test Results: β = 0.284; t = 3.191; p = 0.001 (**ACCEPTED**).

The second hypothesis (H2) states that digital leadership has a positive and significant effect on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The path coefficient of 0.284 demonstrates that digital leadership makes a substantial contribution to improving traffic management effectiveness. The t-statistic value of 3.191 (> 1.96) and the p-value of 0.001 (< 0.05) confirm the statistical significance of this relationship.

These findings demonstrate that leaders possessing a digital vision, technological literacy, and the ability to manage data-driven organizational change can improve operational effectiveness in traffic management. Digital-oriented leadership that is responsive to data facilitates faster and more accurate operational decision-making in the field. These findings are consistent with Hamzah (2025), who states that digital leadership plays an important role in organizational transformation and performance. Leaders with strong digital competencies can direct their teams to utilize technology optimally in traffic management operations.

c. The Effect of Employee Cognitive Workload (X3) on Traffic Management Effectiveness (Y)

Test Results: β = -0.198; t = 2.538; p = 0.011 (**ACCEPTED**).

The third hypothesis (H3) states that employee cognitive workload has a negative and significant effect on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The path coefficient of -0.198 indicates a negative relationship, meaning that the higher the cognitive workload experienced by employees, the lower the effectiveness of traffic management. The t-statistic

value of 2.538 (> 1.96) and the p-value of 0.011 (< 0.05) confirm the statistical significance of this negative relationship.

These findings indicate that excessive mental fatigue and information overload experienced by traffic personnel significantly reduce operational work effectiveness. Employees experiencing high cognitive workloads tend to demonstrate reduced concentration, slower responses to incidents, and lower decision-making accuracy. These findings are consistent with Lestari & Karim (2024), who demonstrate that high mental workloads can reduce employee productivity and cognitive capabilities. Therefore, managing employee cognitive workload is an important factor that must not be overlooked in efforts to improve traffic management effectiveness.

d. The Effect of Intelligent Transportation System (ITS) Implementation Quality (X1) on Readiness for Work Culture Change (Z)

Test Results: β = 0.382; t = 4.494; p = 0.000 (**ACCEPTED**).

The fourth hypothesis (H4) states that ITS implementation quality has a positive and significant effect on readiness for work culture change. The test results indicate that this hypothesis is accepted. The path coefficient of 0.382 demonstrates that ITS quality has a relatively strong influence on employees' readiness for work culture change. The t-statistic value of 4.494 and the p-value of 0.000 confirm the statistical significance of this relationship.

These findings indicate that reliable and properly functioning ITS technology systems stimulate employees' motivation and readiness to move away from conventional working practices toward a digital work culture. When employees perceive that the implemented systems provide tangible benefits and facilitate their work, they become more receptive and prepared to embrace the accompanying changes in work culture. These findings are consistent with Sabella (2023), who states that new technologies that are easy to use and adequately supported can improve individuals' readiness for change. Therefore, investment in ITS implementation quality affects not only technical aspects but also human resource readiness to face digital transformation.

e. The Effect of Digital Leadership (X2) on Readiness for Work Culture Change (Z)

Test Results: β = 0.412; t = 5.086; p = 0.000 (**ACCEPTED**).

The fifth hypothesis (H5) states that digital leadership has a positive and significant effect on readiness for work culture change. The test results indicate that this hypothesis is accepted. The path coefficient of 0.412 represents the highest value among all direct effects in the research model, indicating that digital leadership is the primary driver in fostering employees' readiness for work culture change. The t-statistic value of 5.086 and the p-value of 0.000 confirm the statistical significance of this relationship.

These findings indicate that digital leadership plays a crucial role in developing adaptive mindsets and readiness to embrace a new work culture among employees. Leaders with a clear digital vision, effective change communication skills, and the ability to manage resistance are more successful in encouraging employees to adapt to a new work culture. These findings are consistent with Hamzah (2025) and Fitriana & Sugiyono (2019), who demonstrate that transformational leadership and managerial support have significant effects on readiness for change. Therefore, developing digital leadership competencies should become a primary priority in organizational culture transformation programs.

f. The Effect of Employee Cognitive Workload (X3) on Readiness for Work Culture Change (Z)

Test Results: β = -0.225; t = 2.848; p = 0.004 (**ACCEPTED**).

The sixth hypothesis (H6) states that employee cognitive workload has a negative and significant

effect on readiness for work culture change. The test results indicate that this hypothesis is accepted. The path coefficient of -0.225 indicates a meaningful negative relationship between cognitive workload and readiness for work culture change. The t-statistic value of 2.848 (> 1.96) and the p-value of 0.004 (< 0.05) confirm the statistical significance of this negative relationship.

These findings indicate that excessive mental workload generates cognitive stress, causing employees to become resistant or reluctant to embrace work culture change. Employees experiencing mental exhaustion may lack sufficient cognitive capacity to process new information or adapt to different working practices. Instead, they tend to maintain familiar and comfortable working methods. These findings are consistent with Ann Scheck McAlearney et al. (2021) and Lesna Purnawan (2025), who state that cognitive motivation and individual capacity significantly influence work readiness in adopting new systems. Therefore, cognitive workload management must receive serious attention before or alongside the implementation of work culture change programs.

g. The Effect of Readiness for Work Culture Change (Z) on Traffic Management Effectiveness (Y)

Test Results: β = 0.346; t = 4.023; p = 0.000 (**ACCEPTED**).

The seventh hypothesis (H7) states that readiness for work culture change has a positive and significant effect on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The path coefficient of 0.346 demonstrates that readiness for work culture change makes a substantial contribution to improving traffic management effectiveness. The t-statistic value of 4.023 and the p-value of 0.000 confirm the statistical significance of this relationship.

These findings indicate that employees with an adaptive and digitally oriented work culture readiness demonstrate substantially greater effectiveness and responsiveness in traffic management operations. Employees who are psychologically and behaviorally prepared to accept change tend to be more receptive to innovation, acquire new technological competencies more quickly, and perform operational tasks more effectively. These findings are consistent with Sabella (2023) and Rachmawati et al. (2024), who state that individual readiness for change plays an important role in improving performance. Therefore, developing readiness for work culture change is not merely an intermediate objective but also a direct strategy for improving operational effectiveness.

h. The Mediating Role of Readiness for Work Culture Change (Z) in the Relationship between ITS Implementation Quality (X1) and Traffic Management Effectiveness (Y)

Test Results: β = 0.132; t = 3.142; p = 0.002 (**ACCEPTED**).

The eighth hypothesis (H8) states that readiness for work culture change mediates the effect of ITS implementation quality on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The indirect effect coefficient of 0.132, with a t-statistic of 3.142 and a p-value of 0.002, demonstrates that the mediation effect is statistically significant.

Based on the mediation criteria, since both the direct effect (X1→Y) and the indirect effect (X1→Z→Y) are statistically significant, the resulting mediation type is partial mediation. This means that ITS implementation quality influences traffic management effectiveness through two pathways: (1) directly and (2) indirectly through improvements in employees' readiness for work culture change.

These findings indicate that high-quality ITS implementation not only has a direct impact on operational effectiveness but also generates an indirect impact through the development of employees' readiness for work culture change. When ITS functions reliably and effectively, employees become more confident and motivated to adopt new and more efficient working practices, ultimately improving overall traffic management effectiveness. These findings are consistent with Subianto & Kriswibowo (2024) and Fazrian & Hermana (2025), who emphasize that ITS success depends not only on technical aspects but also on human resource readiness.

i. The Mediating Role of Readiness for Work Culture Change (Z) in the Relationship between Digital Leadership (X2) and Traffic Management Effectiveness (Y)

Test Results: β = 0.143; t = 3.325; p = 0.001 (**ACCEPTED**).

The ninth hypothesis (H9) states that readiness for work culture change mediates the effect of digital leadership on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The indirect effect coefficient of 0.143, with a t-statistic of 3.325 and a p-value of 0.001, demonstrates that the mediation effect is statistically significant.

Similar to H8, since both the direct effect (X2→Y) and the indirect effect (X2→Z→Y) are statistically significant, the resulting mediation type is partial mediation. This means that digital leadership influences traffic management effectiveness through two pathways: directly and indirectly through readiness for work culture change.

These findings indicate that digital leadership successfully improves traffic management effectiveness not only through direct managerial actions in the field but also through an indirect pathway involving the development of organizational readiness for change. Leaders with strong digital competencies can inspire and guide employees to become prepared for change. Consequently, when work culture transformation takes place, employees are already prepared, resulting in improved operational effectiveness. These findings are consistent with Hamzah (2025), who demonstrates that digital leadership influences organizational performance through digital transformation as a mediating variable.

j. The Mediating Role of Readiness for Work Culture Change (Z) in the Relationship between Employee Cognitive Workload (X3) and Traffic Management Effectiveness (Y)

Test Results: β = -0.078; t = 2.363; p = 0.018 (**ACCEPTED**).

The tenth hypothesis (H10) states that readiness for work culture change mediates the effect of employee cognitive workload on traffic management effectiveness. The test results indicate that this hypothesis is accepted. The indirect effect coefficient of -0.078, with a t-statistic of 2.363 and a p-value of 0.018, demonstrates that the mediation effect is statistically significant and negative in direction.

Since both the direct effect (X3→Y) and the indirect effect (X3→Z→Y) are statistically significant and negative, the resulting mediation type is partial mediation with a negative direction. This means that high cognitive workload reduces traffic management effectiveness through two pathways: (1) directly by reducing effectiveness and (2) indirectly through a decline in employees' readiness for work culture change.

These findings indicate that excessive cognitive workload indirectly reduces traffic management effectiveness because it first undermines employees' mental readiness and preparedness for work culture change. Employees experiencing mental fatigue and excessive cognitive demands tend to lose the energy and motivation required to adapt to change, ultimately generating negative consequences for operational work effectiveness. These findings are consistent with Sabella (2023), who demonstrates that changes in cognitive workload influence individual readiness for change, and Lestari & Karim (2024), who emphasize the importance of managing mental workload to maintain work productivity.

Overall, all hypotheses in this study (H1 to H10) are accepted, with the following findings:

1) Direct Effects

ITS implementation quality (β = 0.315), digital leadership (β = 0.284), and readiness for work culture change (β = 0.346) have positive and significant effects on traffic management effectiveness, whereas cognitive workload (β = -0.198) has a negative and significant effect. Meanwhile, in relation to readiness for work culture change, ITS implementation quality (β = 0.382) and digital leadership (β = 0.412) have positive and significant effects, whereas cognitive workload (β = -0.225) has a negative and

significant effect.

2) Indirect Effects (Mediation)

Readiness for work culture change is proven to partially and significantly mediate the effects of ITS implementation quality, digital leadership, and cognitive workload on traffic management effectiveness. The resulting mediation effects are positive for X1 and X2 and negative for X3.

These findings confirm that traffic management effectiveness at the Bogor Regency Transportation Agency is determined not only by technological factors (ITS) but is also strongly influenced by digital leadership, employee cognitive workload management, and readiness for work culture change, both through direct relationships and indirect pathways involving the mediating variable.

4. Conclusion and Recommendation

4.1 Conclusion

4.1.1. Conclusions Based on the Direct Effects Between Variables

a. **The Quality of Intelligent Transportation System (ITS) Implementation has a positive and significant effect on Traffic Management Effectiveness (H1 accepted).** This indicates that the better the technical and operational quality of the implemented ITS (including system reliability, data integration, and operational support), the higher the level of traffic management effectiveness achieved. This finding confirms that investment in intelligent transportation technology infrastructure has a tangible impact on improving traffic flow.

b. **Digital Leadership has a positive and significant effect on Traffic Management Effectiveness (H2 accepted).** This means that digitally oriented leadership, technological literacy, and the ability to manage data-driven change can improve operational effectiveness in traffic management. Responsive and visionary leaders who effectively utilize technology can accelerate the accuracy of decision-making in the field.

c. **Employee Cognitive Workload has a negative and significant effect on Traffic Management Effectiveness (H3 accepted).** The higher the mental workload and cognitive fatigue experienced by employees (including time pressure, task complexity, and mental exhaustion), the lower the effectiveness of traffic management. This finding emphasizes that employees' psychological conditions and cognitive capacities are important factors that must not be overlooked.

d. **The Quality of Intelligent Transportation System (ITS) Implementation has a positive and significant effect on Readiness for Work Culture Change (H4 accepted).** A reliable and properly functioning ITS can encourage employees' motivation and readiness to abandon conventional working methods and transition toward a digital work culture.

e. **Digital Leadership has a positive and significant effect on Readiness for Work Culture Change (H5 accepted).** With the largest coefficient value ($\beta = 0.412$), digital leadership has been proven to be the primary driver in fostering adaptive mindsets and readiness to embrace a new work culture among employees. Visionary and communicative leaders play a crucial role in encouraging employees to adapt to change.

f. **Employee Cognitive Workload has a negative and significant effect on Readiness for Work Culture Change (H6 accepted).** Excessive mental workload causes cognitive stress, making employees more likely to resist and become reluctant to embrace changes in work culture. Employees experiencing mental exhaustion lack sufficient cognitive capacity to adapt to new working methods.

g. **Readiness for Work Culture Change has a positive and significant effect on Traffic**

Management Effectiveness (H7 accepted). Employees with an adaptive and digitally oriented work culture readiness have been shown to perform their traffic management responsibilities more effectively and responsively. Readiness for work culture change therefore serves as an essential foundation for improving operational performance.

4.1.2. Conclusions Based on Indirect Effects (Mediation)

a. **Readiness for Work Culture Change partially mediates the effect of ITS Implementation Quality on Traffic Management Effectiveness (H8 accepted).** This means that ITS quality influences effectiveness not only directly but also indirectly through improvements in employees' readiness for work culture change. High-quality ITS implementation builds employees' confidence and motivation to embrace change, ultimately improving work effectiveness.
b. **Readiness for Work Culture Change partially mediates the effect of Digital Leadership on Traffic Management Effectiveness (H9 accepted).** Digital leadership improves traffic management effectiveness through an indirect pathway by first fostering organizational readiness for cultural change. Digitally competent leaders can inspire employees to become more prepared for change, which subsequently contributes to better operational performance.
c. **Readiness for Work Culture Change negatively and partially mediates the effect of Employee Cognitive Workload on Traffic Management Effectiveness (H10 accepted).** High cognitive workload indirectly reduces traffic management effectiveness because it first undermines or diminishes employees' mental readiness and preparedness to embrace changes in work culture. In other words, excessive mental workload hinders employees' readiness to change, ultimately having a negative impact on work effectiveness.

Overall, all hypotheses in this study (H1 to H10) are accepted. These findings confirm that traffic management effectiveness at the Bogor Regency Transportation Agency is determined not only by technological aspects (ITS) but is also strongly influenced by digital leadership, employee cognitive workload management, and readiness for work culture change, both through direct effects and indirect effects via mediation. The research model demonstrates strong predictive power, with R^2 values of 0.762 for Traffic Management Effectiveness and 0.684 for Readiness for Work Culture Change, as well as high predictive relevance (Q^2).

4.2. Recommendations

4.2.1. Recommendations for the Bogor Regency Transportation Agency

a. Improving the Quality of ITS Implementation (X1):

1) Strengthen the maintenance of ITS infrastructure, such as CCTV, ATCS, and traffic sensors, to maintain high system uptime and ensure the accuracy of the generated data.
2) Improve integration among subsystems to ensure that traffic data can be accessed in real time by all relevant work units.
3) Allocate a dedicated budget for the periodic development and upgrading of ITS technology.
4) Establish a rapid-response mechanism for system disruptions to ensure that traffic operations are not interrupted.

b. Developing Digital Leadership (X2):

1) Organize digital leadership training programs covering data literacy, technology-based decision-making, and change management for echelon-level officials and division heads.
2) Encourage leaders to serve as role models in the use of digital technology so that employees can observe practical examples set by their superiors.

3) Conduct performance evaluations of leaders based on digitalization indicators, such as the level of technology adoption within their respective work units and the effectiveness of digital communication.

c. Managing Employee Cognitive Workload (X3):

1) Conduct periodic workload analyses to identify work units experiencing excessive mental workload.
2) Implement job rotation and fair task distribution to prevent work from accumulating among particular employees.
3) Provide supporting facilities, such as comfortable rest areas, relaxation spaces, and stress management programs for employees.
4) Optimize automation to reduce repetitive administrative tasks that consume employees' cognitive resources.

d. Strengthening Readiness for Work Culture Change (Z) as a Mediating Variable:

1) Link every ITS development initiative to work culture change programs so that employees understand the interrelationship between technology and the adoption of a new work culture.
2) Establish a "Change Champion" team led by visionary leaders in each work unit to serve as agents of change.
3) Integrate new work culture values, including innovation, collaboration, and technological adaptation, into the employee performance appraisal system.
4) Organize regular cultural internalization programs through discussion forums, collective activities, and internal campaigns.

e. Integrated Approach

The Transportation Agency needs to recognize that improving traffic management effectiveness cannot rely solely on technology (ITS). It must also be accompanied by the simultaneous development of digital leadership, cognitive workload management, and readiness for work culture change. All programs and policies should be sustainable and measurable, involving every organizational element, from leadership to operational staff.

4.2.2. Recommendations for Future Research

a. Model Development: Future research is recommended to incorporate other variables that may influence traffic management effectiveness, such as organizational culture, employees' affective commitment, or local government budgetary support, considering that the R^2 value indicates that approximately 23.8% of the variance remains unexplained by the model.

b. Use of Mixed Methods: Future studies may employ a mixed-methods approach (quantitative and qualitative) by incorporating in-depth interviews or focus group discussions (FGDs) to explore employees' perceptions of ITS implementation, digital leadership, and the cognitive workload they experience in greater depth.

c. Expansion of the Research Setting: Similar studies may be conducted in other local government institutions, at the regency/city or provincial levels, under different contextual conditions to examine the generalizability of the findings. Comparisons across regions may provide richer insights into the factors influencing traffic management effectiveness.

d. Longitudinal Studies: Future research is recommended to employ a longitudinal design to examine the dynamics of relationships among variables over a specific period, particularly regarding work culture change, which requires a lengthy process within public organizations.

e. Instrument Development: The measurement instrument for employee cognitive workload may be enhanced by incorporating physiological measurement methods, such as eye-tracking or heart rate variability, to complement subjective questionnaire data and provide a more comprehensive assessment.

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