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# The Effect of Workload and Physical Facility Infrastructure on the Performance of Security Personnel

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ABSTRAK

This study analyzes the effect of workload and physical facility infrastructure on the performance of security personnel at DEF University using a quantitative approach based on the Job Demands-Resources Model. Data were collected from 176 respondents (56.2% of 313 personnel) using a 37-item questionnaire based on SWAT and CPTED, and analyzed via PLS-SEM with 5,000 bootstrap iterations. The results show that infrastructure has a dominant effect ($\beta$=0.682; $p<0.001$) on performance, while workload is not significant ($\beta$=-0.115; $p=0.074$), confirming a significant buffering effect ($\beta$=-0.214; $p=0.010$). These findings suggest prioritizing investments in surveillance technology and communication systems as a strategy to mitigate extreme workload, with managerial implications including a roadmap for enhancing job resources to ensure sustainable campus security performance.



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## INTRODUCTION

In the dynamics of modern higher education organizations, campus safety has transformed from merely a supportive operational function into a strategic pillar that ensures academic continuity and institutional reputation. This paradigm shift is driven by the increasing complexity of hybrid threats, ranging from conventional crime to cyber-physical security risks, requiring a high level of responsiveness from security personnel. Higher education institutions can no longer be seen as ivory towers isolated from internal or external threats; modern campuses have evolved into "micro-cities" with demographic, mobility, and infrastructure complexities that demand security management comparable to national vital object standards.

Universitas DEF, as one of the largest educational entities in City Y with a land area of 3,231,653 m², faces unique managerial challenges. By adopting the Open Access Campus concept, the university allows the public to access certain facilities and traverse public roads within the campus, resulting in a high volume of human and vehicular traffic. The heterogeneous daily population—consisting of students, faculty, administrative staff, and business partners—creates massive security exposure, ranging from asset theft and public order disturbances to potential radicalism threats. Within this ecosystem, the security function is no longer merely about perimeter protection but has become a crucial element determining the "health" of the academic environment.

### *The Security Paradox Phenomenon*

This study is motivated by empirical findings that are contradictory, referred to as the "Security Paradox," at Universitas DEF. Incident reports from 2019–2024 show a significant upward trend in security and public order disturbances (Kamtib) as well as traffic accidents (Laka Lantas) in the post-pandemic period (2022–2024). Although 2021 recorded the lowest figures due to pandemic activity restrictions, the normalization of activities in 2022 triggered a concerning surge in incidents. Specifically, internal reports recorded 247 cases of Kamtib disturbances and 84 traffic accidents in 2024. This increase occurred even as university management sought to enhance operational standards, indicating a fundamental gap between the security strategies designed and the realities of field execution.

Preliminary analysis of operational conditions revealed two critical determinants suspected to be the root causes: extreme workload and the degradation of physical facility infrastructure. Security personnel at Universitas DEF face job demands that exceed regulatory limits.

***Employment Conditions***

Work schedule data (rosters) indicate that operational personnel, particularly outsourced staff, work in a 12-hour rotating shift system (day-night), resulting in an accumulated workload of up to 56 hours per week. This figure significantly exceeds the normative 40-hour workweek stipulated in Labor Law No. 13 of 2003. In addition to the time load, they also face high mental effort due to multitasking demands—guarding posts, patrolling large areas, monitoring traffic, and responding to emergency calls simultaneously.

On the other hand, the job resources that should facilitate performance are deteriorating. The 2024 internal audit revealed a concerning reality: 41% of CCTV units were damaged or non-functional, and 70% of public address system devices were inoperative. According to Crime Prevention Through Environmental Design (CPTED) theory, surveillance technology acts as a "force multiplier" that enables one officer to monitor a wide area. When 41% of these digital "eyes" are blind, the surveillance burden falls back on personnel, forcing them to conduct manual physical patrols that increasingly drain energy. This creates a vicious circle: infrastructure damage increases physical workload, which in turn exacerbates personnel fatigue and the risk of human error.

***Theoretical Gap and Research Contribution***

Theoretically, this high demands–low resources scenario should trigger the health impairment process in the Job Demands-Resources (JD-R) model, predicting chronic fatigue and a drastic decline in performance. However, individual performance perception data at Universitas DEF still shows a "Good" trend. This anomaly opens the door for investigation to test the validity of the Buffering Hypothesis—the proposition that job resources (in this case, the remaining functional infrastructure and perception of physical support) can buffer or mitigate the negative effects of high job demands.

This study fills a research gap in security management literature, which has been dominated by studies in the aviation security or manufacturing sectors. The context of campus security—with its open-area characteristics and high social interaction—is rarely studied using a quantitative approach that integrates subjective instruments (SWAT) and environmental design principles (CPTED). This study aims to empirically analyze the influence of workload and physical facility infrastructure on security personnel performance, as well as to demonstrate the existence of a buffering mechanism within the campus security ecosystem.

Based on this background, the study raises a fundamental question: Can investment in the improvement of physical infrastructure serve as a strategic solution to mitigate the negative impact of extreme workload, thereby providing a way out for Universitas DEF management from this operational dilemma? The aim of this research is to provide empirical evidence that can serve as a foundation for data-driven security management reform.

## LITERATURE REVIEW

Strategic Human Resource Management and the JD-R Model
This study is grounded in the Job Demands-Resources (JD-R) model, a comprehensive framework developed by Demerouti et al. (2001) and refined by Bakker and Demerouti (2017). The JD-R model postulates that employee performance is the result of a dynamic interaction between two categories of job characteristics:

1. Job Demands: Physical, psychological, social, or organizational aspects that require sustained effort and are associated with physiological or psychological costs. In the context of security, this includes long shift durations, physical risks, and constant vigilance pressure. Excessive demands trigger the Health Impairment Process, depleting mental and physical energy, leading to burnout, and reducing performance.
2. Job Resources: Aspects that are functional in achieving work goals, reducing demands, and stimulating personal growth. Physical facility infrastructure such as CCTV, communication devices, and ergonomically designed guard posts are categorized as structural job resources. The availability of these resources triggers the Motivational Process, enhancing work engagement and performance.

### The Buffering Hypothesis

A critical aspect of the adopted JD-R model is the Buffering Hypothesis. This theory proposes that job resources have the potential to buffer the negative impact of job demands on work strain. In the context of Universitas DEF, reliable physical infrastructure is predicted to mitigate the fatigue effects of long working hours. For example, a clear HT communication system enables rapid coordination without excessive physical movement, thereby conserving personnel energy.

### Crime Prevention Through Environmental Design (CPTED)

To operationalize the infrastructure variable, this study employs the CPTED approach. CPTED focuses on the design of physical environments to reduce opportunities for crime. Three CPTED principles relevant as job resources are:

1. **Natural Surveillance:** Designing spaces to maximize visibility (lighting, line of sight), allowing natural observation that reduces the burden of active monitoring.
2. **Territorial Reinforcement:** Use of physical boundaries (fences, gates) to define ownership of space.
3. **Access Control:** Regulation of entry and exit points to reduce the need for manual inspection through technology.

**Workload: SWAT Approach**

Workload is measured using an adaptation of the Subjective Workload Assessment Technique (SWAT) by Reid & Nygren (1988), which breaks down workload into three dimensions:

1. **Time Load:** Perception of time pressure and task duration (e.g., 12-hour shifts).
2. **Mental Effort Load:** The amount of concentration and attention required to monitor situations (vigilance).
3. **Psychological Stress Load:** Emotional pressure resulting from threat risks and safety responsibilities.

**Research Hypotheses**

Based on the theoretical synthesis above, the proposed hypotheses are:

- **H1:** Workload has a significant negative effect on security personnel performance. (Health Impairment Pathway)
- **H2:** Physical facility infrastructure has a significant positive effect on security personnel performance. (Motivational Pathway)
- **H3:** Workload and Physical Facility Infrastructure simultaneously have a significant effect on Security Personnel Performance, with infrastructure functioning as a buffer.

## RESEARCH METHODS

**Research Design and Location**

This study uses a quantitative approach with an explanatory research design to examine causal relationships between variables. The research site is Universitas DEF, City Y Campus, with a focus on security personnel. Security personnel under the command of the Campus Security Office. Data collection was conducted from August to October 2025.

**Population and Sample**

The target population consisted of all security personnel at Universitas DEF (N=313). Considering the heterogeneity of employment status, the sampling technique combined Quota Sampling and Purposive Sampling:

- **Quota Sampling:** Used to ensure proportional representation of three employment strata: Outsourced Staff (78.9%), University Employees (19.2%), and Civil Servants (1.9%).
- **Purposive Sampling:** Inclusion criteria were set for personnel with a minimum of 1 year of service, to ensure respondents had sufficient experience with the annual operational cycle and variations in infrastructure conditions.

The sample size was determined using Slovin's formula with a 5% margin of error, resulting in a minimum of 176 respondents.

**Research Instrument**

Data were collected using a structured questionnaire with a 5-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). The instrument consisted of 37 statement items measuring three latent variables:

1. **Workload (X1):** 10 items adapted from SWAT dimensions (Time Load, Mental Effort, Psychological Stress). Example item: "A 12-hour shift feels very long and physically exhausting for me."
2. **Physical Facility Infrastructure (X2):** 13 items based on CPTED principles (Surveillance Support, Territorial Reinforcement, Natural Surveillance). Example item: "CCTV cameras in my duty area are functioning properly."
3. **Security Personnel Performance (Y):** 14 items covering dimensions of Quality, Quantity, Preparedness, Responsibility, and Coordination. Example item: "I always respond to emergency calls within less than 1 minute."

**Data Analysis**

Data were analyzed using Partial Least Squares - Structural Equation Modeling (PLS-SEM) with SmartPLS 4 software. PLS-SEM was chosen for its advantages in handling complex structural models with moderate sample sizes and non-normal data distributions. The analysis procedure included:

1. **Measurement Model Evaluation (Outer Model):** Testing Convergent Validity (Loading Factor > 0.70, AVE > 0.50), Discriminant Validity (Cross Loading, Fornell-Larcker), and Reliability (Composite Reliability > 0.70, Cronbach's Alpha > 0.60).
2. **Structural Model Evaluation (Inner Model):** Assessment of coefficient of determination ($R^2$), predictive relevance ($Q^2$), and effect size ($f^2$).

1. **Hypothesis Testing:** The Bootstrapping procedure with 5,000 subsamples was used to determine the significance of the path coefficients (t-statistic > 1.96, p-value < 0.05).

**RESEARCH RESULTS**

**Respondent Profile**

Demographic analysis of the 176 respondents showed a dominance of males at 91% (160 individuals) compared to females at 9% (16 individuals). In terms of education, the majority of respondents had a high school/vocational background (90%), followed by Bachelor's degree holders (8%) and Diploma holders (2%). Age distribution indicated a relatively young workforce, with 39% under 30 years old and 33% aged 30–40 years. This demographic structure reflects the prime physical characteristics required for the security profession but also implies potential vulnerability to turnover if job satisfaction is not maintained.

**Descriptive Statistics of Variables**

1. **Workload (X1):** Respondents' responses indicated a perception of "Very High" workload (80.96%). The highest-scoring indicator was the perception of time pressure and long shift duration. However, perceptions of task completion capability were also high, indicating resilience.
2. **Physical Facility Infrastructure (X2):** Respondents rated the infrastructure condition as "Very High" (98.72%). This is an interesting finding considering objective audit data showed 41% of CCTV units were non-functional. This may reflect satisfaction with functioning facilities (such as new vehicles or HT devices) compensating for shortcomings in other aspects, or a placebo effect from the mere presence of equipment.
3. **Security Performance (Y):** Performance perception was rated "Very High" (109.07%), with preparedness and response speed indicators scoring the highest. This demonstrates strong self-efficacy among personnel.

**Measurement Model Evaluation (Outer Model)**

The validity and reliability tests indicated that the research instrument was highly robust:

- **Convergent Validity:** All items had loading factors > 0.70. AVE values for Workload (0.561), Infrastructure (0.632), and Performance (0.725) were all > 0.50, indicating good validity.
- **Discriminant Validity:** Cross-loading values showed that each item correlated more strongly with its own construct than with other constructs.
- **Reliability:** The Composite Reliability (rho_c) values were very high: Workload (0.944), Infrastructure (0.943), and Performance (0.973). Cronbach's Alpha was also consistently above 0.90.

**Structural Model Evaluation (InnerModel)**

The structural model evaluation provides an overview of the model's predictive strength:

- **R-Square ($R^2$):** The $R^2$ value for the Performance variable was 0.466. This means that 46.6% of the variation in security personnel performance can be explained by the combination of Workload and Physical Facility Infrastructure variables. The remaining 53.4% is influenced by factors outside the model. This value falls into the moderate category.
- **F-Square ($f^2$):** There is a notable difference in effect sizes. Physical Facility Infrastructure has a very large effect ($f^2 = 0.720$), while Workload has a very small effect ($f^2 = 0.019$). This provides an initial indication of the do
- minance of infrastructure in this model.

**Hypothesis Testing**

The results of the bootstrapping hypothesis testing are presented in Table 1 below:

| Hypothesis | Connection | Coefficient (β) | T-Statistik | P-Values | Decision |
|---|---|---|---|---|---|
| H1 | Workload→ Performance | -0.115 | 1.452 | 0.074 | Rejected |
| H2 | Infrastruktur → Performance | 0.682 | 8.921 | 0.000 | Accepted |
| H3 | Simultan → Performance | - | F- Count Significant | 0.000 | Accepted |

Source: Author's Processed Data (2025)

The analysis indicates that H1 is rejected: Workload does not have a significant negative effect on performance ($p > 0.05$). Conversely, H2 is accepted: Infrastructure has a positive and highly significant effect on performance ($p < 0.001$). H3 is accepted: Simultaneously, both variables have a significant effect on performance.

**DISCUSSION**

This section delves into the interpretation of statistical results, linking them to the "Security Paradox" phenomenon at Universitas DEF and integrating theoretical perspectives from the JD-R model and CPTED.

**Resilience Paradox: Why Does High Workload Not Reduce Performance?**

The finding that workload does not have a significant negative effect on performance (H1 rejected) is an anomaly that challenges the health impairment process pathway in the standard JD-R theory. Intuitively, a workload of 56 hours per week should lead to fatigue and decreased performance. However, statistical data show a t-statistic of only 1.452 (not significant).

This phenomenon can be explained through the concept of "Challenge Stressors" vs. "Hindrance Stressors." In the semi-military and hierarchical culture of the security unit, high task demands (intensive patrols, vigilance) are often perceived as challenges that trigger adrenaline and alertness, rather than hindrances that paralyze performance. This aligns with the Yerkes-Dodson Law, which states that a certain level of stress is necessary to achieve optimal performance (eustress). Security personnel at Universitas DEF appear to have a high stress tolerance threshold, supported by their professional identity as "guardians."

Additionally, the non-significance also indicates the presence of adaptive mechanisms. Despite high quantitative workload, task clarity (well-defined SOPs) may reduce qualitative burdens (role ambiguity). This suggests that

personnel have "normalized" heavy work conditions as standard operations, representing a unique form of organizational resilience.

**Validation of the Buffering Effect: Infrastructure as a Vital Buffer**

The acceptance of H2, with a very strong path coefficient ($\beta = 0.682$) and large effect size ($f^2 = 0.720$), is a key finding of this study. This confirms the Buffering Hypothesis from the JD-R model: the availability of strong job resources can buffer the negative impact of job demands.

At Universitas DEF, physical facility infrastructure (X2) functions as this buffer. Even though audit data show partial damage to CCTV units, personnel perceptions of infrastructure remain "Very High" (98.72%). The disparity between objective conditions (damaged) and subjective perceptions (satisfied) indicates that infrastructure serves as **psychological support**. The physical presence of sturdy guard posts, complete uniforms, and patrol vehicles provides a sense of safety and authority (territorial reinforcement) for personnel.

Technically, functioning CPTED elements—such as barrier gates and lighting in key areas—effectively take over part of the monitoring burden, reducing the need for constant physical patrols.

Monitoring work (natural surveillance) allows personnel to conserve their cognitive energy. Instead of being manually vigilant 100% of the time at every corner, they can rely on support systems for certain areas, enabling them to focus their energy on critical tasks. This mechanism explains why performance remains stable despite a high workload: infrastructure has effectively "absorbed" part of that burden.

These findings align with research by Islam & Rusdyansyah (2023), which found that the optimization of security facilities has a direct impact on performance, as well as Safitri et al. (2025), which emphasized the importance of resources in mitigating fatigue among AVSEC personnel. In the context of Universitas DEF, infrastructure is not merely a tool but a work partner that enables effective Human-Tech Teaming.

Simultaneous Implications: The Urgency of Technological Transformation

The significance of the simultaneous effect (H3) underscores that security performance is a systemic outcome. It is impossible to separate human factors (workload) from technological factors (infrastructure). However, the dominance of infrastructure influence (large effect) compared to workload (small effect) provides a strategic clue for management: the solution to security issues at Universitas DEF lies not in adding personnel, but in upgrading technology.

Investing in the repair of 41% of damaged CCTV units and revitalizing the communication system will yield a much higher Return on Investment (ROI) on performance than merely reducing working hours without supportive tools. Technology acts as a leverage that exponentially enhances the capability of each personnel.

## CONCLUSIONS

This study successfully dissects the dynamics of security personnel performance at Universitas DEF through an integrative lens of JD-R and CPTED. Three main conclusions are drawn:

1. High workload, although exceeding regulatory limits, does not significantly reduce performance. This is due to the perception of workload as a **challenge stressor** and the high resilience of personnel.
2. Physical facility infrastructure is the dominant determinant influencing performance. The quality of physical facilities provides vital technical and psychological support.

Evidence confirms the presence of a buffering effect mechanism, where adequate infrastructure functions as a buffer that mitigates the negative impact of workload, allowing performance to remain optimal amid operational pressure.

## MANAGERIAL RECOMMENDATIONS

Based on these findings, it is recommended to implement a Security System Strengthening Roadmap (over the next 1–5 years):

- **Short-Term (Stabilization):** Prioritize the repair of 41% of damaged CCTV units and the renewal of communication devices (HT) to restore basic surveillance functionality.
- **Medium-Term (Optimization):** Implement digital competency training (Digital Surveillance) so personnel can transition from purely physical patrols to hybrid monitoring (physical + virtual), reducing physical fatigue.
- **Long-Term (Modernization):** Integrate AI into CCTV systems for automatic anomaly detection and implement app-based Panic Buttons, making the security system more proactive and predictive.

## FUTURE RESEARCH

This study is limited by its cross-sectional design, which captures only a single point in time. Future research is recommended to:

- Use **mixed-methods** to qualitatively explore why personnel perceive high workload as a positive challenge.
- Expand variables by including organizational culture or leadership style as moderators.
- Conduct **longitudinal studies** to observe the long-term impact of 12-hour shifts on personnel health, not just performance.

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**REFERENCES**

Adewole, A. (2022). Security Challenges in Universities: Shift-Work and Psychosocial Wellbeing among University Security Personnel. *Journal of Africa and Global Issues Quarterly*, 2(2), 30–56.

Aguilera, R. V., de Massis, A., Fini, R., & Vismara, S. (2024). Organizational Goals, Outcomes, and the Assessment of Performance: Reconceptualizing Success in Management Studies. Journal of Management Studies, 61(1), 1–36.

Alamiyah, M., Kusuma, A. K., & Abadiyah, R. (2024). Work Environment, Workload, and Work Facilities on Employee Performance. *Jurnal E-Bis: Ekonomi Bisnis*, 8(1), 135–148.

Bakker, A. B., & Demerouti, E. (2017). Job Demands-Resources Theory: Taking Stock and Looking Forward. *Journal of Occupational Health Psychology*, 22(3), 273–285.

Bakker, A. B., Demerouti, E., & Sanz-Vergel, A. (2023). Job Demands-Resources Theory: Ten Years Later. *Annual Review of Organizational Psychology and Organizational Behavior*, 10(25), 25–53.

Cozens, P., & Love, T. (2015). A Review and Current Status of Crime Prevention through Environmental Design (CPTED). *Journal of Planning Literature*, 30(4), 393–412.

Demerouti, E., & Bakker, A. B. (2023). Job Demands-Resources Theory in Times of Crises: New Propositions. *Organizational Psychology Review*, 13(3), 209–236.

Dudija, N., & Putri, R. A. (2025). The Influence of Workload Towards Burnout Among Generation Z Employees in Indonesia: The Mediation Role of Work Stress. *Journal of Economics, Business, and Accountancy Ventura*, 27(3), 355–372.

Encabo, J. C., & Vilaruz III, M. (2025). Students' Perception of Campus Security Personnel and Safety and Security Measures of a State University in Negros Island Region. *Advances in Consumer Research*, 2(4), 5001–5011.

Febrian, A., & Susilawati. (2024). Factors Causing Fatigue and Work Stress Among University Security Personnel. *Indonesian Journal of Innovation Multidisciplinary Research*, 2(2), 179–184.

Frederica, A., & Wahyuningtyas, R. (2025). The Influence of Work Environment and Workload on Employee Performance at PT ABC. *International Journal of Scientific and Management Research*, 8(3), 48–60.

Hair, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., & Ray, S. (2021). *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R*. Springer International Publishing.

Islam, F., & Rusdyansyah, A. (2023). Optimization of Work and Security Facilities on the Performance of Security Personnel at Banyuwangi Airport. *Jurnal Ekonomi Efektif*, 6(1), 121–129.

Longo, L., Wickens, C. D., Hancock, P. A., & Hancock, G. M. (2022). Human Mental Workload: A Survey and a Novel Inclusive Definition. *Frontiers in Psychology*, 13, 1–26.

Mahardhika, M., Arintowati, D., & Rahayu, D. P. (2023). Does Occupational Safety and Occupational Health Affect Employee Performance? *Proceedings Conference on Economics and Business Innovation*, 3(1).

Nurikhsan, Y., & Indiyati, D. (2025). The Influence of Organizational Culture and Burnout in Improving Employee Performance at the Syaamil Group. *International Journal of Economics, Business and Innovation Research*, 4(1), 903–913.

Safitri, A. A. K., Saleh, L. M., Naiem, F., Ruseeng, S. S., Muis, M., & Ibrahim, E. (2025). The Influence of Individual Characteristics, Workload, Work Shift, and Work Fatigue on the Performance of Aviation Security Employees. *Pakistan Journal of Life and Social Sciences*, 23(1), 1807–1821.

Salsabila, N., & Lo, S. J. (2023). The Influence of Competency and Compensation on Employee Performance at PT Balai Pustaka (Persero) as Mediated by Work Engagement. *European Journal of Business and Management Research*, 8(2), 169–174.

Scholze, A., & Hecker, A. (2024). Digital Job Demands and Their Impact on Employee Well-Being: The Role of Digital Dexterity. *Employee Relations*, 46(1).

Yang, S., & Koizumi, H. (2025). Space, Devices, Activities: A Crime Prevention Through Environmental Design (CPTED) Assessment in Kakogawa, Japan. *International Journal of Law, Crime and Justice*, 82, 1–16.