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DEVELOPMENT OF AUTOMOBILES' COMPUTERISED MAINTENANCE MANAGEMENT SYSTEM TO IMPROVE THE UDART'S BUSES AVAILABILITY PERFORMANCE:

CASE OF UDART HEADQUARTERS, DAR ES SALAAM

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Abstract
This study intended to develop Automobiles' Computerised Maintenance Management System (CMMS) to Improve UDART Buses' Availability Performance, Case of UDART Headquarters-Dar es Salaam. The specific study objectives were to assess factors affecting the availability performance of public service vehicles owned by UDART, to develop a CMMS model for improving the availability performance of public service vehicles owned by UDART, and to develop a CMMS for improving the availability performance of passengers' service vehicles owned by UDART. The theories adopted are Resource Based Theory, Institutional Theory and Human Capital Theory. The study used a cross-sectional survey design. The data collection process used structured questionnaires. The data collection process involved 71 respondents using simple random and purposive sampling methods. Data processing used the Statistical Package for Social Sciences version 26 program to estimate numerical values and descriptive statistics to indicate study results. Inferential and descriptive statistics tested relationships of study variables, comprising OLS multiple regression analysis, percentages, frequencies and correlations. Again, the study has brought an efficient maintenance management model to guide UDART and other passengers' transporters in running their firms productively. Finally, the resulting CMMS have revealed the significance of improving the availability performance of UDART's buses to 90.32%. Nevertheless, UDART should invest well in maintenance tools and equipment as they significantly affect the availability performance of the buses.

***Index Terms*: Computerised Maintenance Management, Passengers Service, Availability Performance**

INTRODUCTION

UDART, a public transport system, has 240 buses providing regular and express services. However, the company faces challenges such as prolonged waiting times and crowded buses, especially during peak hours. Proper maintenance management is crucial for UDART operations, as it helps retain the reliability and durability of vehicles. As the population grows, the demand for passenger service vehicles increases, leading to traffic congestion, air pollution, and exhaust pollution.

The quality of service and the sustainability of the business require sufficient funding. Reliability of service is crucial for passenger access and customer satisfaction. Technical faults or breakdowns can lead to service disruptions, making it essential to prioritize maintenance and upkeep. Regular changes of engine oils, filters, and other failed parts are necessary to maintain vehicle condition, performance, and productivity. This study aims to develop a Computerized Maintenance Management System (CMMS) to enhance the availability performance of UDART buses.

NEED OF THE STUDY.

UDART, a public transportation system, faces challenges due to unplanned downtime and decreased capacity. With 240 buses, the minimum availability performance is 85%. Overcrowded buses and long wait times, particularly during peak hours, contribute to fatigue and increased depreciation rates. This study aims to develop Automobiles Computerized Maintenance Management System (CMMS) to improve bus availability and service performance.

RESEARCH METHODOLOGY

This section details the research design, area, research method, population, sampling, and sample size. In addition, methods for data collection, mainly primary and secondary data sources, are the parts of the same. Furthermore, data analysis methods, reliability and validity, and ethical considerations are also parts of it.

3.1 Population and Sample

The study used a quantitative approach, focusing on the UDART headquarters in Jangwani. The research involved 360 staff members, including maintenance managers, supervisors, technicians, and operators. The sample size was 78 respondents, with only 71 completing questionnaires. Again, the sample size computation followed a measured formulation (1).

$$n = \frac{N}{1+N.e^2}$$ (Basit, A. *et al* 2017)................................ (1)

Again, $$n = \frac{360}{1+360*0.1^2}$$

$$= 78$$

Where:

n = Sample size or number of participants required

N = Research population = 360

e = Standard sampling error (10%) is accepted or tolerated.

Seventy-one participants met the degree of accuracy required for the research after entering values for the respective variables in the calculation.

Table 1: Sample Size Distribution

S/N	Respondents	Population Size	Sample Size	Data Collection Method
1.	Maintenance team	60	13	Structured Questionnaires
2.	Supporting staff	300	65	Structured Questionnaires
Total		**360**	**78**	

3.2 Data and Sources of Data

This study used primary random selection and purposive sampling to recruit participants from UDART's maintenance staff. Data collection used structured questionnaires and secondary data through UDART statistics. The study used documentary reviews for secondary data collection.

3.3 Conceptual framework

Qiu et al. (2021) defined a conceptual framework as a setup of interrelated concepts on the study variables and their relationships. The conceptual framework in Figure 1 contains eight independent variables. The assessments realized their effects on the availability performance of UDART buses.

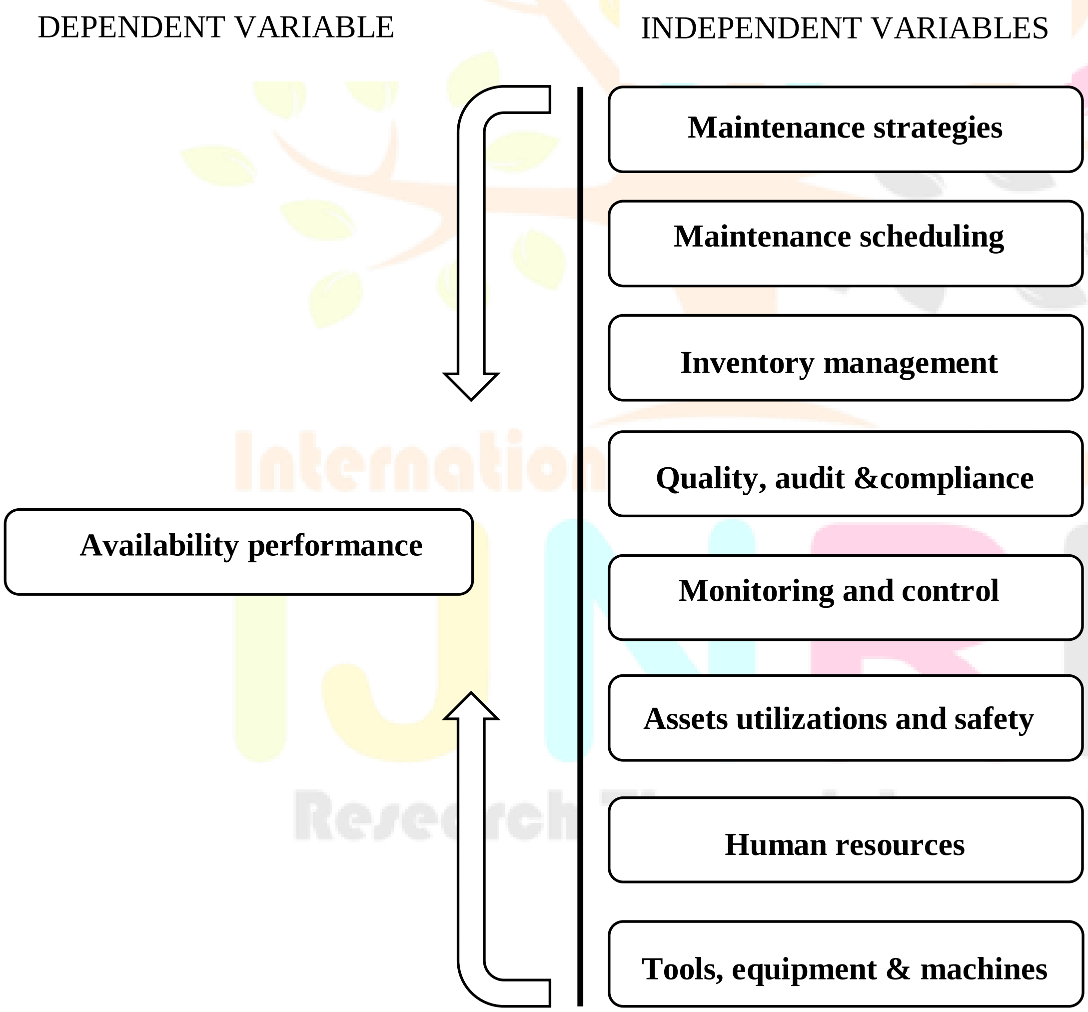

Figure 1: Conceptual framework of the study

Accordingly, the study used maintenance strategies, maintenance scheduling, inventory management and control, quality audit and compliance, monitoring and control, utilization and safety, human resources management, and availability of tools and equipment as independent variables of the availability performance of UDART buses as the dependent variable. The importance of the measured variables was dependent on maintenance operations at UDART. The prediction showed that the services improved in quality, productivity increased, profitability increased, service costs decreased, and there was growth and diversification in passenger service delivery. In general, the factors or variables showed that the availability performance of UDART buses improved.

3.5 Data Collection Methods

3.5.1 Primary Data

The study team selected the participants in the survey among UDART's maintenance staff members. Once more, the data collection used structured questionnaires. The rating of the questions' responses was appropriate. The following were the five options that respondents used to express their opinions:

1=Strongly disagree; 2=Disagree; 3=Neutral; 4=Agree; 5=Strongly agree
1=Low; 2=Average; 3=High; 4=Very High; 5=Extremely High.

3.5.2 Secondary Data

Relatively, secondary data for this research were collected by reviewing UDART statistics. In particular, the average planned vehicle availability performance information covers 12 months between April 2023 and March 2024. Besides, UDART is the custodian of all relevant performance data.

3.5.3 Data Collection Tools

This study utilized structured questionnaires for primary data collection to attain research objectives. Again, the study team used documentary reviews for secondary data gathering. Each tool was a complement to the other in providing relevant research data.

3.5.4 Data Analysis

This study utilised the MLR model to analyse the correlation between study variables statically. This type of analysis is necessary to determine the effects of study variables on a specific research topic and to identify the most relevant factors. Additionally, this analysis can reveal the influences between relevant factors.

Consequently, gathered data were coded and entered into the SPSS 26 program. Furthermore, data analysis used descriptive statistics: percentage, frequency, and Pearson's correlations between research variables. Besides, the research employed inferential statistics through multiple linear regression (MLR) models in examining the strength of correlations between research variables. Further, P values ranging from 0.000 to 0.05 indicated relevant significance levels.

3.5.5 Descriptive Analysis

The study analysed data by considering eight variables: maintenance plans and strategies; maintenance schedules; maintenance inventory management and control; maintenance quality, audit, and compliance management; maintenance monitoring and control; automobile utilisation and safety management; human resources management; and availability of tools, equipment, and machines.

Furthermore, some of the independent variables are composites of related study variables. Accordingly, maintenance strategies combine three related independent variables. In particular, the given variable includes the current maintenance strategy, the effects of excessive preventive maintenance, and the effects of poor preventive maintenance on the availability performance of the UDART fleet.

Similarly, maintenance scheduling is a collection of four independent variables. These are maintenance waiting time, delayed condition restorations, and skipped inspections. Again, the given variable includes unscheduled automobile maintenance.

Additionally, maintenance quality, audit, and compliance management combined maintenance financial resources, maintenance costs, maintenance performance, and the quality of the maintenance crew were parts of the study. In addition, monitoring and control comprise the effects of the correct use of workshops, maintenance processes, maintenance policies, and maintenance culture.

The study assessed the factors affecting automobile availability performance at UDART, Dar es Salaam, Tanzania. Similarly, automobile utilisation comprises the effects of overloading, road accidents, and the vehicle's wear. Again, human resources management combines the effects of staff shortages, skilled labourers, and a maintenance management crew. However, data analysis used descriptive statistics.

RESULTS AND DISCUSSION

4.1 Effects of independent variables on Buses' availability performance

The study's findings exposed assorted responses from its respondents. Besides, respondents' opinions exposed several factual information. Consequently, Table 4.16 analyses the effects of the relevant independent study variables on UDART buses' availability performance. The responses had a mean of 2.2958 and a standard deviation of 0.48321. Correspondingly, it is evident that maintenance strategies moderately affect the availability performance of UDART buses. Further, the effect of the maintenance schedule is moderate, as indicated by the mean of 2.3204 and standard deviation of 0.90651. Furthermore, inventory management and control affect the fleet moderately, as indicated by the mean of 2.7606 and standard deviation of 1.10149.

On the other hand, maintenance quality, auditing, and compliance management affect buses' availability performance. This remark is evident by a static mean of 3.4613 and a standard deviation of 0.60893. Additionally, the availability performance of UDART buses is highly dependent on automobile maintenance monitoring and control, as indicated by the mean of 3.1761 and standard deviation of 0.52765. Furthermore, the observation indicated that the availability performance of the UDART fleet is highly affected by the usage and safety management of the buses. Respectively, this observation is evident by the static mean of 3.0422 and the standard deviation of 0.91186.

Again, the study observed that human resources management highly affects buses' availability performance. This observation presents a mean of 3.0845 and a standard deviation of 0.79276. Also, maintenance tools, equipment, and machines contribute moderately to the buses' availability. This effect has a mean score of 2.8685 and a standard deviation of 0.36134.

4.2 Mathematical Model and CMMS Development

This study used multiple linear regressions to analyze the effects of automobile CMMs on the availability performance of UDART buses' fleets. The model examines the relationships between dependent and independent variables, including maintenance strategies, maintenance scheduling, inventory management, maintenance quality audit and compliance management, monitoring and control, and availability of maintenance tools, equipment and machines.

Table 3: Model Summary

Model	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	**R^2 Change**	**F Change**	**Statistical Change**		
							df1	df2	Sig. F Change
1	.974[a]	.950	.943	.10595	.950	145.820	8	62	.000

a. Predictors: (Constant) availability of tools and equipment; maintenance inventory management and control; human resources management; maintenance strategies, maintenance scheduling; automobile utilization and safety management; maintenance quality audit and compliance management; monitoring and control.

Table 3 is an output of a linear regression test done with the aid of SPSS. Again, the same represents the model summary of the relevant test. Furthermore, it describes the model characteristics. In addition, the assessment involved eight independent variables: availability of tools, machines and equipment; maintenance inventory management and control; human resources management; maintenance strategies; maintenance schedules; automobile utilization and safety management; maintenance quality audit and compliance management; and monitoring and control.

R is the coefficient of correlation between independent and dependent variables. Again, the reference relies on the fact that values greater than 0.4 require further or secondary data analysis. In particular, relationships between relevant study variables are evident by the coefficient of .974. Accordingly, this value indicates a good correlation.
R^2 is the coefficient of determination presenting a total variation on the dependent variable as the independent variables have explained them. Values greater than 0.5 indicate that the given model determines a particular relationship effectively. Accordingly, the determination among the variables holds a coefficient of .950, which is good.

Adjusted R^2 indicates the general result: the deviation of sample results from the population accommodated in the particular multiple regression. Notably, there should be a difference between R^2 and Adjusted R^2. In this case, the value of adjusted R^2 is 0.943

Significance value (P-value or Sign value):
The assessment relied on a 95% confidence or 5% significance level. In that regard, p-values must always be less than 0.05. Table 3 indicates the relevant significance level as .000. Accordingly, the results are statistically significant.

F-ratio:
Considerably, the F ratio signifies enhancement in the predictor variable. The same is evident in a model fit relative to its inaccuracies. The F-ration greater than 1 signifies an efficient model. Similarly, Table 3 indicates that the F value is 145.820, which is good.

Testing for a 5% significance level or 95% confidence level was done using the study variables. Once more, P would have a P <0.000-0.05 based on the significance value (P value) in the ANOVA and regression coefficient. As a result, the pertinent test used the SPSS program, and the outcomes are in ANOVA *Table 4.*

The results reveal that the model is statistically significant in affecting the dependent variable. The reason is the probability value 0.000, which is less than the 0.05 significance level. The eight independent variables were unique and statistically significant in affecting the availability performance of UDART buses in Dar es Salaam, Tanzania.

Table 4: ANOVA[a]

Model 1		**Sum of Squares**	**df**	**Mean Squares**	**F**	**Sig.**
	Regression	13.095	8	1.637	145.820	.000[b]
	Residual	0.696	62	0.011		
	Total	**13.791**	**70**			

a. Dependent Variable: Availability Performance
b. Predictors: (Constant), Availability of tools, machines and equipment, Inventory management, Human resources management, Maintenance strategies, Maintenance scheduling, Automobile utilization and safety, Maintenance quality audit, control and compliance, Maintenance monitoring and control

4.3 Regression Coefficients

Table 5. Regression Coefficients [a]

		Unstandardized Coefficients		**Standardized Coefficients**		
Model		B	Std. Error	Beta(β)	t	Sig.
1	(Constant)	.818	.125		1.353	.002
	Strategies	.11	.004	.138	1.416	.001
	Scheduling	.08	.017	.124	3.126	.002
	Inventory mgt.	.058	.024	.124	4.104	.000
	Quality control	-.086	.136	-.123	-2.196	.003
	Monitoring	-.01	.024	-.125	-2.195	.001
	Utilization	.021	.025	.109	3.077	.003
	HR Management	.01	.023	.124	3.435	.000
	Tools, equipment	.089	.139	.703	6.233	.000

a. Independent Variables
b. Dependent Variable: Availability Performance

Table 5 shows that strategies (β=0.110, P<0.001); scheduling (β=0.08, P<0.002); inventory management (β=0.058, P<0.000); quality control (β= -0.086, P<0.003); monitoring and control (β= -0.1, P<0.001); utilization (β=0.021, P<0.003); human resources management (β=0.01, P<0.000); and tools, equipment and machines (β=0.089, P<0.000 had significant relationships with availability performance. Since all P values were lower than the alpha value (α), 0.05, they were all approved.

Additionally, by controlling other variables, it was found that the availability performance of UDART buses was positively statistically and significantly affected by maintenance strategies, maintenance scheduling, inventory management, automobile utilization and safety, human resources management, and the availability of tools, equipment, and machines. Likewise, the same correlated negatively with maintenance quality control and maintenance monitoring. Thus, the results suggest that the UDART fleet's availability performance depends on using the invested resources properly.

The study's findings also share similarities with those of Soltanali et al. (2020). Once more, the study showed that scheduled maintenance greatly enhances vehicle performance. Additionally, effective maintenance management always produces deemed achievements.

4.4 Multiple Linear Regressions Model Development

The study has considered eight factors or variables that affect availability performance. Accordingly, the relevant coefficients indicate their effects. Again, studied variables or factors, with the effect of their coefficients, collectively bring the relevant availability performance. The multiple linear regression equation 2 presents the overall availability performance of the UDART fleet:

$$AP_{(T)} = \beta_0+\beta_1 AP_{(MS)}+\beta_2 AP_{(SH)}+\beta_3 AP_{(IM)}+\beta_4 XAP_{(MQ)})+\beta_5 AP_{(MC)}+\beta_6 AP_{(UT)}+\beta_7 P_{(HR)}+\beta_8 P_{(TE)}+ \varepsilon \text{.............................}2$$

Accordingly, the following definitions apply to the availability performance model structured into equation 2:

$AP_{(T)}$ = Total Availability Performance, the dependent variable.
β_0 = Constant term
β_1, β_2, β_3, β_4, β_5, β_6, β_7 and β_8 = Coefficients of the dependent or predictor variables
$AP_{(MS)}$ = Factor related to automobile maintenance strategies
$AP_{(SH)}$ = Factor related to automobile maintenance scheduling
$AP_{(IM)}$ = Factor related to automobile maintenance inventory management and control
$AP_{(MQ)}$ =Factor related to maintenance quality audit and compliance management
$AP_{(MC)}$ =Factor related to automobile maintenance monitoring and control
$AP_{(UT)}$ = Factor related to automobile utilization and safety management
$AP_{(HR)}$ = Factor related to automobile maintenance human resources management
$AP_{(TE)}$ = Factor related to automobile maintenance tools, equipment and machines
ε= Error term or residuals for Availability Performance model
Evidently, after adding relevant coefficients, the model is represented as:

$$AP_{(T)} = 0.817+0.11AP_{MS}+0.08AP_{SH}+0.058AP_{IM}-0.086AP_{MQ}-0.1AP_{MC}+0.021AP_{UT}+0.01AP_{HR}+0.089AP_{TE} \text{....}3$$

4.5 Model Validation

The failure rate of the UDART's buses is between 30 to 50 buses daily. Thus, the average breakdown rate is 45 buses. The computation of the relevant availability uses equation 4:

$$\text{Availability} = \frac{\text{Uptime}}{\text{Uptime + Downtime}} = \frac{\text{Uptime}}{\text{Total time}} \quad \text{(Hirwani and Chaturvedani, 2015)}$$

$$= \frac{\text{Number of available buses}}{\text{Total number of buses}} = \frac{\text{Total number of buses-broken down buses}}{\text{Total number of broken down buses}} \text{.... ....}4$$

$$= \frac{240-40}{240}$$

$$= 84\%$$

The UDART fleet's availability performance is lower than predicted by the mathematical model, indicating the need for a CMMS to improve it. Validation and projected performance data from June 2023 to May 2024 tested the model's validity. The results showed high accuracy and a precision of 99.99%. Effective maintenance strategies, schedule management, quality control, monitoring, inventory management, bus utilization, human resources management, and availability of tools and equipment are perfect predictors of UDART fleet availability performance.

4.6 Discussion

The study findings were consistent with other research on maintenance performance, such as Darestani et al. (2020) and Ingemarsdotter et al. (2021). These studies highlight the benefits of condition-based maintenance in extending the useful life of assets, reducing expenses, and improving productivity.

The study suggests that UDART should manage its resources effectively to achieve its goals, aligning with the Resource-Based Theory. It recommends implementing internal maintenance and transportation policies to maintain buses' availability performance. The study identified eight factors affecting fleet availability, forming the basis for a mathematical model that helps plan and manage vehicle maintenance tasks. The model was used to establish a web-based CMMS for improving UDART buses' availability performance.

4.7 Summary of Results

The study collected responses from participants regarding specific variables, which resulted in varied opinions. The study aimed to achieve three objectives. The same are: assess factors affecting the availability performance of public service vehicles owned by UDART, develop a mathematical model to improve availability performance and create a computerised maintenance management system.

Additionally, the predictor variables positively affected the availability of UDART's fleet. Conversely, the correlation between the dependent and independent variables is 97.4%. Again, the predictor variables accounted for 95% of the UDART's availability performance, with 5% as the influence of other variables.

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REFERENCES

Abbas, D., Di Fulvio, F., Marchi, E., Spinelli, R., Schmidt, M., Bilek, T. & Han, H.-S. 2021. A Proposal For An Integrated Methodological And Scientific Approach To Cost Used Forestry Machines. *Croatian Journal of Forest Engineering: Journal for Theory and Application of Forestry Engineering*, 42**,** 63-75.

Abbas, Y., Martinetti, A., Moerman, J.-J., Hamberg, T. & Van Dongen, L. A. 2020. Do You Have Confidence In How Your Rolling Stock Has Been Maintained? A Blockchain-Led Knowledge-Sharing Platform for Building Trust between Stakeholders. *International Journal of Information Management,* 55**,** 102228.

Abdel Wahed Ahmed, M. M. & Abd El Monem, N. 2020. Sustainable and Green Transportation for Better Quality of Life Case Study Greater Cairo–Egypt. *Hbrc Journal,* 16**,** 17-37.

Abdurrahman, A. R. & Yusuf, M. 2018. Does the Risk Profile, Liquidity Ratio, Good Corporate Governance and Intellectual Capital able to affect the Financial Performance of Islamic Banks in Indonesia. *My Uniceb,* 1**,** 8.

Agustiady, T. K. & Cudney, E. A. 2018. Total Productive Maintenance. *Total Quality Management & Business Excellence***,** 1-8.

Ahlemann, F., Legner, C. & Lux, J. 2021. A Resource-Based Perspective of Value Generation through Enterprise Architecture Management. *Information & Management*, 58**,** 103266.

Alavian, P., Eun, Y., Liu, K., Meerkov, S. M. & Zhang, L. 2019. The (A, B)-Precise Estimates of MTBF and MTTR: Definitions, Calculations, and Induced Effect on Machine Efficiency Evaluation. *Ifac-Papersonline,* 52**,** 1004-1009.

Aljumaili, M. & Al-Chalabi, H. 2016. Data Quality of Maintenance Data: A Case Study in Maximo CMMS.

Alkhoori, F. A. & Maghelal, P. K. 2021. Regulating the Overloading Of Heavy Commercial Vehicles: Assessment of Land Transport Operators in Abu Dhabi. *Transportation Research Part A: Policy and Practice*, 154**,** 287-299.

Almomani, H. & Aldaihani, A. H. 2021. Using Computerised Maintenance Management System (CMMS) In Roads Maintenance Operations. *International Journal of Environmental Science,* 6.

Alsyouf, I., Alsuwaidi, M., Hamdan, S. & Shamsuzzaman, M. 2021. Impact of ISO 55000 on Organizational Performance: Evidence from Certified UAE Firms. *Total Quality Management & Business Excellence,* 32**,** 134-152.

Amberg, B., Amberg, B. & Kliewer, N. 2019. Robust Efficiency in Urban Public Transportation: Minimizing Delay Propagation in Cost-Efficient Bus and Driver Schedules. *Transportation Science*, 53**,** 89-112.

Ambriško, Ľ. & Teplická, K. 2021. Proactive Maintenance as a Tool of Optimization for Vehicle Fleets, In Terms Of Economic and Technical Benefits. *Acta Polytechnica Hungarica,* 18.

Anas, R., Surbakti, M. S., Sembiring, I. S. & Hastuty, I. P. GIS for USU Campus Transportation Asset Management. IOP Conference Series: Materials Science and Engineering, 2021. IOP Publishing, 012010.

Antikainen, M., Uusitalo, T. & Kivikytö-Reponen, P. 2018. Digitalization as an Enabler of Circular Economy. *Procedia CIRP,* 73**,** 45-49.

Aransyah, D., Rosa, F. & Colombo, G. 2020. Smart Maintenance: A Wearable Augmented Reality Application Integrated With CMMS to Minimize Unscheduled Downtime. *Computer-Aided Design and Applications,* 17**,** 740-751.

Arena, F., Pau, G. & Severino, A. 2020. A Review on IEEE 802.11 P for Intelligent Transportation Systems. *Journal of Sensor and Actuator Networks,* 9**,** 22.

Atombo, C. & Wemegah, T. D. 2021. Indicators for Commuter's Satisfaction and Usage of High Occupancy Public Bus Transport Service in Ghana. *Transportation Research Interdisciplinary Perspectives,* 11**,** 100458.

Bădău, F., Abramović, B., Cormoș, A. C. & Iordache, V. 2020. Management of Urban and Regional Rail: Case Study Bucharest. *Logi–Scientific Journal on Transport and Logistics,* 11**,** 120-131.

Banerjee, N., Morton, A. & Akartunalı, K. 2020. Passenger Demand Forecasting In Scheduled Transportation. *European Journal of Operational Research,* 286**,** 797-810.

Bannikov, D. & Sirina, N. Service Maintenance and Repair of Passenger Cars in the Concept of Digital Enterprise. IOP Conference Series: Materials Science and Engineering, 2020. IOP Publishing, 012168.

Bartle, C. & Chatterjee, K. 2019. Employer Perceptions of the Business Benefits of Sustainable Transport: A Case Study of Peri-Urban Employment Areas in South West England. *Transportation Research Part A: Policy and Practice*, 126**,** 297-313.

Basit, A., Sebastian, V., & Hassan, Z. (2017). Impact of leadership style on employee performance (A Case study on a private organization in Malaysia). International Journal of Accounting & Business Management, 5(2), 112-130.

Basu, D., Roy, S., Maitra, S. R. & Majumdar, B. B. 2020. An Assessment Towards Identifying Improvement Needs Of Urban Bus Stop Infrastructure: Knowledge Gained From Bhubaneswar. *Transportation Research Procedia,* 48**,** 3802-3813.

Began, A. 2020. *Assessment and Improving City Buses Failure: A Case Study on Anbessa City Bus Service Enterprise (ACBSE).*

Berthod, O. 2018. Institutional Theory of Organizations.

Birago, D., Mensah, S. O. & Sharma, S. 2017. Level of Service Delivery of Public Transport and Mode Choice in Accra, Ghana. *Transportation Research Part F: Traffic Psychology and Behaviour,* 46**,** 284-300.

Borovyk, S. 2020. Modeling the Process of Assessing the Efficiency and Development of Production Activities of the Passenger Fleet in Different Operating Conditions. *Technology Audit and Production Reserves,* 5**,** 55.

Boryaev, A., Malygin, I. & Marusin, A. 2020. Areas of Focus in Ensuring the Environmental Safety of Motor Transport. *Transportation Research Procedia,* 50**,** 68-76.

Breheny, P. & Burchett, W. 2017. Visualization of Regression Models Using Visreg. *R J.,* 9**,** 56.

Bubou, G. M., Gumus, S. & Ogungbemi, A. A. Institutionalising the Maintenance Management Function in Public Sector Organisations for Sustainable Infrastructural Services in Nigeria. Nigerian Society of Engineers' Annual General Meeting and Conference (Abuja,), 2017.

Camilleri, M. A. 2018b. The Tourism Industry: An Overview. *Travel Marketing, Tourism Economics and the Airline Product***,** 3-27.

Cara, A. 2020. Challenges of Girls' Basic Education in South Sudan. Reflecting Critically Through the Capability Approach and Human Capital Theory. *Reflecting Critically Through the Capability Approach and Human Capital Theory. (August 14, 2020).*

Carvalho, T. P., Soares, F. A., Vita, R., Francisco, R. D. P., Basto, J. P. & Alcalá, S. G. 2019. A Systematic Literature Review Of Machine Learning Methods Applied To Predictive Maintenance. *Computers & Industrial Engineering,* 137**,** 106024.

Chansky, B. & Modica, N. F. 2018. Productivity in Transit: A New Measure of Labor Productivity for Urban Transit Systems. *Monthly Labor Review***,** 1-32.

Chengula, D. & Kombe, K. 2017. Assessment of the Effectiveness of Dar es Salaam Bus Rapid Transit (DBRT) System in Tanzania. *Int. J. SCI,* 36**,** 10-30.

Corazza, M. V., Magnalardo, S., Musso, A., Petracci, E., Tozzi, M., Vasari, D. & De Verdalle, E. 2018. Testing an Innovative Predictive Management System for Bus Fleets: Outcomes from the Ravenna Case Study. *IET Intelligent Transport Systems,* 12**,** 286-293.

Da Silva, R. F., De Andrade Melani, A. H., De Carvalho Michalski, M. A., De Souza, G., Nabeta, S. I. & Hamaji, F. H. Defining Maintenance Performance Indicators For Asset Management Based On ISO 55000 And Balanced Scorecard: A Hydropower Plant Case Study. Proceedings of the 30th European Safety and Reliability Conference and the 15th Probabilistic Safety Assessment and Management Conference, Venice, Italy, 2020. 1-5.

Dai, J. & Menhas, R. 2020. Sustainable Development Goals, Sports and Physical Activity: The Localization of Health-Related Sustainable Development Goals through Sports in China: A Narrative Review. *Risk Management and Healthcare Policy***,** 1419-1430.

Daily, J. & Peterson, J. 2017. Predictive Maintenance: How Big Data Analysis Can Improve Maintenance. *Supply Chain Integration Challenges in Commercial Aerospace.* Springer.

Damsere-Derry, J., Adanu, E. K., Ojo, T. K. & Sam, E. F. 2021. Injury-Severity Analysis of Intercity Bus Crashes In Ghana: A Random Parameters Multinomial Logit with Heterogeneity in Means and Variances Approach. *Accident Analysis & Prevention,* 160**,** 106323.

Danbold, F. & Huo, Y. J. 2017. Men's Defense Of Their Prototypicality Undermines The Success Of Women In Stem Initiatives. *Journal of Experimental Social Psychology,* 72**,** 57-66.

Darestani, S. A., Ganji, M. & Imannezhad, R. 2020. What Are The Key Determinants Of Maintenance Performance? *Production,* 30.

De La Torre, R., Corlu, C. G., Faulin, J., Onggo, B. S. & Juan, A. A. 2021. Simulation, Optimization, and Machine Learning In Sustainable Transportation Systems: Models and Applications. *Sustainability,* 13**,** 1551.

Deb, S. & Ahmed, M. A. 2018. Determining The Service Quality Of The City Bus Service Based On Users' Perceptions And Expectations. *Travel Behaviour and Society,* 12**,** 1-10.

Deveci, M., Pamucar, D., Goslar, I., Delen, D. & Martínez, L. 2022. A Fuzzy Einstein-Based Decision Support System for Public Transportation Management at Times of Pandemic. *Knowledge-Based Systems,* 252**,** 109414.

Dossou, P.-E. 2018. Impact of Sustainability on the Supply Chain 4.0 Performance. *Procedia Manufacturing,* 17**,** 452-459.

Dou, X., Meng, Q. & Liu, K. 2021. Customized Bus Service Design For Uncertain Commuting Travel Demand. *Transportmetrica A: Transport Science,* 17**,** 1405-1430.

Duer, S., Woźniak, M., Paś, J., Zajkowski, K., Bernatowicz, D., Ostrowski, A. & Budniak, Z. 2023. Reliability Testing Of Wind Farm Devices Based On The Mean Time Between Failures (MTBF). *Energies,* 16**,** 1659.

Fan, H. & Beukes, E. A. 2021. Enhancing Financial Sustainability and Commercial Viability of Bus Rapid Transits in Sub Saharan Africa.

Feng, Y.-W., Tian, J., Xue, X.-F. & Lu, C. Spare Parts Allocation of Amphibious Aircraft Based On Hybrid Two-Level Repair. IOP Conference Series: Materials Science and Engineering, 2021. IOP Publishing, 022056.

Fernandes, E., Holanda, M., Victorino, M., Borges, V., Carvalho, R. & Van Erven, G. 2019. Educational Data Mining: Predictive Analysis of Academic Performance of Public School Students in the Capital of Brazil. Journal of Business Research, 94, 335-343.

Florence, C. S., Bergen, G., Atherly, A., Burns, E., Stevens, J. & Drake, C. 2018. Medical Costs of Fatal and Nonfatal Falls in Older Adults. Journal of the American Geriatrics Society, 66, 693-698.

Freeman, R. E., Dmytriyev, S. D. & Phillips, R. A. 2021. Stakeholder Theory and the Resource-Based View of the Firm. Journal of Management, 47, 1757-1770.

Frigg, R. & Nguyen, J. 2017. Models and Representation. Springer Handbook of Model-Based Science, 49-102.

Gerum, P. C. L., Altay, A. & Baykal-Gürsoy, M. 2019. Data-Driven Predictive Maintenance Scheduling Policies for Railways. Transportation Research Part C: Emerging Technologies, 107, 137-154.

Gholizadeh, H., Fazlollahtabar, H., Fathollahi-Fard, A. M. & Dulebenets, M. A. 2021. Preventive Maintenance for the Flexible Flowshop Scheduling Under Uncertainty: A Waste-To-Energy System. Environmental Science and Pollution Research, 1-20.

Gidebo, F. A. & Szpytko, J. Transport System Telematics for Smart Cities Concept-A Case of Addis Smart Mobility Project. International Conference on Transport Systems Telematics, 2020. Springer, 17-26.

Giri, K., Bhonde, B. & Patil, A. 2020. Time and Cost Overruns in the Construction Industry due to Downtime of the Construction Equipment and Machineries.

Gueller, M., Hegmanns, T. & Kuhn, A. 2016. Performance Availability and Anticipatory Change Planning Of Intralogistics Systems: A Simulation-Based Approach. Logistics Journal: Proceedings, 2016.

Gunathilaka, N., Tennakoon, W. & Wjajm, L. 2021. Factors Affecting to the Success of Computerised Maintenance Management System in Multinational Beer Companies.

Haynes, K. E. & Fotheringham, A. S. 2020. Gravity and Spatial Interaction Models.

Hemmati, N., Rahiminezhad Galankashi, M., Imani, D. M. & Farughi, H. 2018. Maintenance Policy Selection: A Fuzzy-ANP Approach. Journal of Manufacturing Technology Management, 29, 1253-1268.

Hendarmin, H. & Kartika, M. 2019. The Relationship between Human Capital and the Regional Economy Productivity. Jejak, 12, 138-152.

Hitka, M., Kučharčíková, A., Štarchoň, P., Balážová, Ž. Lukáč, M. & Stacho, Z. 2019. Knowledge and Human Capital as Sustainable Competitive Advantage in Human Resource Management. Sustainability, 11, 4985.

Huk, K. & Kurowski, M. The Use of Telematics Systems in Transport and Forwarding Management. 5th EAI International Conference on Management of Manufacturing Systems, 2022. Springer, 305-317.

Hussain, S., Mahmud, U. & Yang, S. 2020. Car E-Talk: An IoT-Enabled Cloud-Assisted Smart Fleet Maintenance System. Ieee Internet of Things Journal, 8, 9484-9494.