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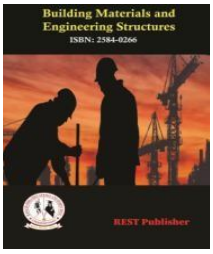

Evaluation of Urban Public Transport Priority Performance

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Abstract: *The evaluation of urban public transport priority performance is a critical aspect of assessing the effectiveness and efficiency of public transportation systems in urban areas. With the increasing challenges posed by population growth, traffic congestion, and environmental concerns, it is imperative to prioritize and enhance the performance of public transport systems to provide sustainable and reliable mobility options. Which refers to the measures and strategies implemented to give priority to public transport modes such as buses, trams, and trains over private vehicles on the road? These measures aim to improve the efficiency and reliability of public transport, reduce travel times, enhance passenger comfort, and encourage modal shift from private vehicles to public transport. Improved urban mobility: Urban areas face increasing challenges of traffic congestion and limited road capacity. Evaluating public transport priority performance helps identify effective measures to improve the flow of public transport, reduce travel times, and enhance overall urban mobility. This research can lead to the development of more efficient and reliable public transport systems, encouraging people to choose sustainable transportation options. Sustainable urban development: Urban public transport plays a crucial role in reducing the environmental impact of transportation, including greenhouse gas emissions and air pollution. Evaluating public transport priority measures allows researchers to assess their effectiveness in promoting modal shift from private vehicles to public transport, leading to a reduction in overall vehicular emissions. This research contributes to sustainable urban development by promoting environmentally friendly transportation options. Comprehensive data gathering and analysis are part of the process used in land evaluation techniques. Various biophysical parameters, such as Punctuality for both the first and last stop, transfer convenience, the gathered data is then combined with statistical approaches, modelling techniques, and geospatial analytic tools. Punctuality for both the first and last stop, transfer convenience, Public transport site 500 m coverage rate, Morning and evening peak bus average operating speed, Public transport smart card popularity rate. Punctuality for both the first and last stop, transfer convenience, Public transport site 500 m coverage rate, Morning and evening peak bus average operating speed, Public transport smart card popularity rate. Punctuality for both the first and last stop got first rank and public transport site 500m coverage rate got last rank from this we conclude that Punctuality for both the first and last stop got first rank and public transport site 500m coverage rate got last rank.*

Key words: *Punctuality for both the first and last stop, Transfer convenience, Public transport site 500 m coverage rate*

1. INTRODUCTION

The proliferation of public-private partnerships is proof that numerous governments all over the world are pushing for the introduction of competition in public services and procurement. The goal of this drive for competition is to persuade private providers of public services to offer them at reasonable costs without sacrificing quality. Competitive tendering through auctions has been a standard practise to do this, and the European Union is also developing directives to encourage similar practises among its member nations. But it's crucial to understand that the use of tendering methods relies on a too basic premise. Theoretical developments have demonstrated that these processes are not impervious to fraud and conspiracy. Competition can be influenced by how a tender is organised, which could result in less severe competition than what is actually guaranteed by competitive tendering.to a limited number of competitors [1] Urban public transport systems' (UPTS') availability, accessibility, information, timeliness, customer service, comfort, security, and environment are among the factors that define their service quality. These components are described by a set of indicators, and composite indicators are frequently employed to efficiently condense the multifaceted characteristics. One of the primary driving forces behind our work was the difficulty of developing such an indication for UPTS. According to Nardo (2008), the Organisation for Economic Cooperation and Development (OECD) created a ten-step algorithm that serves as the foundation for the approach for creating composite indicators. How to meaningfully mix many dimensions that are measured on various scales is an important consideration when creating a composite indicator. Making decisions regarding the technique and weighting approach to be employed is required. For aggregating the initial information. There are various suggested weighting methods, which can be derived from statistical models or participatory methods [2]. Concerns about personal safety on public transport have been found to significantly affect ridership and the overall travel experience for different passenger groups, according to a number of worldwide studies. An important aspect of the period's urban growth was the emergence of "industrial giants" in significant cities across the nation. The original idea of workers living in barracks close to the industries, referred to as "settlement at factories" (Glazychev, 2008), gradually made way for more commodious mass housing development that was built farther away from employment centres. Along with this change, transit-oriented development principles were put into practise, resulting in the construction of 5- and 9-story residential complexes both in metropolitan cores and outlying suburbs. There was a concerted policy to limit the ownership of home vehicles throughout the Soviet era. The Russian populace had very little access to private transport, and this policy was regularly upheld. Horses were owned by public entities or collective farms, or kolkhozes, while private automobile ownership was still uncommon in the 1930s and beyond [4] In order to accomplish their strategic goals for the growth of transport, executive authorities use a variety of regulatory, operational, and economic measures under the umbrella of a transport strategy, including urban transport policy. A transport strategy must be chosen in order to effectively implement transport policy measures. The development of branch strategies, such as one specialised for urban transport, is based on this plan. Implementing transport policy measures in urban areas necessitates the adoption of an adequate urban transport development strategy because urban public transport is a crucial part of both urban and suburban mobility. In addition to a complete set of technological, operational, and economic measures, addressing transportation issues in cities necessitates the deployment of regulatory measures. Urban regions must have better mobility options if they are to develop sustainably [5] In agglomerations, urban people' mobility is steadily rising. Private cars, which unfortunately have negative environmental effects like pollution, noise, and space occupation, are the main cause of this expansion. Several actions can be taken to solve these problems and improve the standard of public transit. These actions are intended to increase safety and security, increase station and vehicle comfort, and promote higher use of public transit. The amount of time commuters spend travelling is one of their main worries, though. Congestion and traffic signals have an impact on how long it takes for surface public transit, such as buses, trams, and other high occupancy vehicles, to traverse a distance. The usefulness and justification of comparing the performance of urban bus operators through benchmarking are examined in this study. The value of benchmarking lies in its ability to identify significant variations in performance among operators, enabling the sharing of lessons and best practices. For benchmarking to be considered justifiable, it is important to ensure that external factors do not disproportionately impact performance, making the results incomparable. The study utilized data collected by the International Bus Benchmarking Group, in collaboration with Imperial College London, during the period from 2001 to 2007. The data focused on 10 medium to large bus operators from nine countries. To ensure accurate comparisons, the data underwent stratification and normalization, taking into account variations in factors such as vehicle size, demand patterns, and commercial speed. The results of the study indicate that benchmarking the performance of urban bus operations is both useful and justifiable, given that an adequate number of operators with similar operating characteristics and comparable urban environments are included in the comparison. The usefulness of benchmarking relies on the presence of significant performance variations among operators, which allows for valuable insights and lessons to be learned. Additionally, the justifiability of benchmarking depends on the extent to which external factors impact performance, ensuring that the results are comparable.

2. MATERIALS AND METHOD

Punctuality for both the first and last stop: Data Collection: Gather relevant data regarding the Punctuality for both the first and last stop. This data should include information on the scheduled departure and arrival times, as well as the actual departure and arrival times for each trip. Additionally, collect data on any incidents or delays that may have affected the punctuality expectations. Analyze Data: Analyze the collected data and calculate the punctuality rate for each route or line. Identify any patterns or trends in the data that may help explain the performance. Identify Causes of Delays: Examine the data to determine the primary causes of delays. This could include factors such as traffic congestion, road construction, accidents, operational issues, or any other events that affected the punctuality. Evaluate Public Transport Priority System: Assess the effectiveness of the public transport priority system in improving punctuality. Compare the performance of routes or lines with the priority system to those without it. Identify any differences in punctuality rates and analyze the impact of the priority measures. Customer Feedback: Gather feedback from passengers regarding the punctuality and overall performance of the public transport system. Conduct surveys, interviews, or utilize online feedback platforms to collect their opinions and suggestions for improvement. Continuous Improvement: Use the findings from the evaluation to implement measures for continuous improvement. This could involve adjusting schedules, optimizing routes, coordinating with other stakeholders (such as traffic management authorities), or investing in infrastructure upgrades.

Transfer convenience: Transfer convenience refers to the ease and efficiency of transferring between different modes or routes within a public transport system. It is an important aspect of urban public transportation as it directly impacts the overall travel experience for passengers and encourages the use of public transport by providing seamless connections. Physical Infrastructure: Assess the design and layout of transfer points, such as bus stops, train stations, or interchanges. Evaluate whether they are well-connected, provide clear signage, have adequate seating and shelter, and are designed to accommodate a large number of passengers during peak hours. Transfer Time: Analyze the average time required for passengers to transfer between different modes or routes. This includes considering walking distances, waiting times, and any necessary navigation or ticketing procedures. Evaluate whether the transfer times are reasonable and efficient, minimizing unnecessary delays. Schedule Coordination: Examine the coordination of schedules between different modes or routes. Evaluate whether there are frequent and well-timed connections to minimize waiting times for passengers. Assess the level of integration between different transport operators to ensure smooth transitions between services.

Public transport site 500 m coverage rate: Define the Study Area: Determine the geographic scope of the evaluation, such as a city, neighborhood, or specific transit corridor. Identify Public Transport Sites: Identify all relevant public transport sites within the study area, including bus stops, train stations, or tram stations. Create a comprehensive list or map of these sites. Determine the 500-Meter Radius: Establish a radius of 500 meters around each public transport site. This can be done using mapping software or tools like Google Maps. Measure the distance from the center point of each site and create a circle with a radius of 500 meters. Analyze Coverage: Determine the extent of coverage for each public transport site by examining the population or area within the 500-meter radius of each site. This can be done by overlaying population data or land use data onto the map and calculating the total population or area within each circle. Calculate Coverage Rate: Calculate the coverage rate by dividing the total population or area within the 500-meter radius of all public transport sites by the total population or area of the study area. Multiply the result by 100 to express it as a percentage. Coverage Rate = (Total Population/Area within 500m of Public Transport Sites) / (Total Population/Area of Study Area) * 100Interpret the Results: The coverage rate represents the proportion of the study area that is within a 500-meter radius of a public transport site. A higher coverage rate indicates better accessibility and a greater reach of public transport services. Data Collection: Gather data on bus operating speeds during the morning and evening peak periods. This data should include information on the actual speeds of buses at different points along their routes during these peak hours. It is ideal to collect data from multiple routes to capture a representative sample of bus operations. Define Peak Periods: Determine the specific time frames that constitute the morning and evening peak periods. These periods typically correspond to the busiest hours of the day when traffic congestion is high and demand for public transportation is at its peak. Common morning peak hours are typically between 7:00 AM and 9:00 AM, while evening peak hours often occur between 4:00 PM and 7:00 PM, but these can vary based on local conditions. Calculate Average Operating Speed: Calculate the average operating speed of buses during the morning and evening peak periods. This can be done by dividing the total distance travelled by buses during these periods by the total time taken. The result will give you the average speed in kilometers per hour (km/h) or miles per hour (mph).Analyze the Results: Analyze the average operating speeds to assess the efficiency and performance of buses during peak hours. Compare the speeds to desired benchmarks or industry standards to determine if they are meeting expectations. Consider the impact of factors such as traffic congestion, road conditions, and bus scheduling on the observed speeds.Identify Causes of Slow Speeds: Identify the primary causes of slow operating speeds during peak periods. This could include factors such as heavy traffic, bottlenecks, inadequate bus priority measures, or inefficient bus operations. Analyze the data and look for patterns or trends that may indicate specific areas or routes with consistently slower speeds.

Public transport smart card popularity rate: Data Collection: Gather data on the usage of the public transport smart card system. This can include information on the number of smart cards issued, the number of transactions made using smart cards, and the total revenue generated through smart card transactions. Additionally, collect data on the overall ridership of the public transport system to provide context. Define Metrics: Determine the key metrics that will be used to evaluate the popularity of the smart card system. Common metrics include the percentage of passengers using smart cards for their journeys, the percentage of total fare revenue collected through smart card transactions, and the growth rate of smart card adoption over time. Analyze Usage Patterns:

Analyze the data collected to understand the usage patterns of the smart card system. Identify any trends or patterns that indicate an increase or decrease in smart card usage. Examine the usage by different demographic groups or specific routes to identify any variations in popularity .Assess User Satisfaction: Gather feedback from smart card users to assess their satisfaction with the system. Conduct surveys, interviews, or use online feedback platforms to collect their opinions on the convenience, ease of use, reliability, and benefits of using the smart card. Consider factors such as the availability of top-up options, ease of card registration, and any additional services or benefits associated with the smart card system. Compare with Other Payment Options: Compare the popularity of the smart card system with other payment options available, such as cash or paper tickets. Evaluate the percentage of passengers using smart cards compared to other payment methods to understand the preference and acceptance of the smart card system.

3. DECISION MAKING TRIAL AND EVALUATION LABORATORY (DEMATEL)

The method is indeed a valuable approach for examining cause-and-effect relationships in complex systems. It provides decision-makers with a systematic framework to understand the key factors and their impacts within a system. Here is a breakdown of the procedure Problem Identification: Clearly define the issue or situation that requires investigation. Identify the key components or factors that influence the decision-making process. Causal Relationship Definition: Analyze the effects of each element on every other element within the system. Identify the root causes of the problem. Direct Relationship Matrix: Create a matrix that represents the strength and direction of the causal connections between the different components.Indirect Relationship Matrix: Calculate the indirect relationships between variables based on the direct relationships established in the previous step. Centrality Evaluation: Determine the centrality of each element with respect to the system as a whole and how it affects the other components. This helps identify the most influential factors. Causal Loop Diagram: Use a causal loop diagram to visually depict the causal relationships between the variables. This aids in understanding the interconnections and feedback loops within the system. Decision-making and Interpretation: Analyze the results and interpret the findings. Decision-makers can utilize this information to prioritize actions, allocate resources effectively, and address issues within the system. The DEMATEL method provides a quantitative and logical approach to evaluate complex decision-making situations. By comprehending the relationships between components and their relative importance, decision-makers can make more informed and effective decisions. It is worth noting that specific adaptations or modifications of the procedure may exist based on the application or specific field of study. Overall, the DEMATEL method offers a valuable tool for decision-makers in various domains, including management, engineering, and social sciences, to better understand the causal relationships and make informed decisions in complex systems. The Decision Making Trial and Evaluation Laboratory (DEMATEL) method is indeed a valuable approach for examining cause-and-effect relationships in complex systems. It provides decision-makers with a systematic framework to understand the interdependencies and impacts of various factors within a system. Here is a step-by-step overview of the DEMATEL procedure: Problem identification: Clearly define the problem or situation that requires analysis and decision-making. Identify the key components or factors that influence the decision-making process. Causal relationship definition: Determine the cause-and-effect relationships between the identified factors. Analyze how each element affects every other element within the system. Direct relationship matrix: Construct a matrix that illustrates the strength and direction of the causal connections between the different factors. This matrix helps visualize the direct relationships. Indirect relationship matrix: Calculate the indirect relationships between the variables based on the direct relationships. Indirect relationships represent the cumulative effects that propagate through the system. Centrality evaluation: Assess the centrality of each element in relation to the overall system it influences. This analysis helps identify the key factors that have significant impacts on the system. Causal loop diagram: Utilize a causal loop diagram to depict the causal relationships between the variables. This diagram aids in understanding the complex interdependencies and feedback loops within the system. Decision-making and interpretation: Analyze the results and interpret the findings. Decision-makers can use the provided information to prioritize activities, allocate resources, or address issues effectively. The DEMATEL method offers a quantitative and logical approach to evaluate complex decision-making situations. By providing decision-makers with a comprehensive understanding of the relationships between factors and their relative importance, it supports more informed and effective decision-making processes. It is important to note that specific adaptations or modifications of the DEMATEL procedure may exist based on the application or field of study. Researchers and practitioners may tailor the approach to suit the specific needs of their analysis or decision-making context. The Decision Making Trial and Evaluation Laboratory (DEMATEL) method is indeed a valuable approach for examining cause-and-effect relationships in complex systems. It provides decision-makers with a systematic framework to understand the key factors and their impacts within a system. Here is a step-by-step breakdown of the DEMATEL procedure: Problem identification: Clearly define the problem or situation that requires analysis. Identify the key components or factors that influence the decision-making process. Causal relationship definition: Determine the cause-and-effect relationships between the identified factors. Analyze the effects of each element on every other element within the system. Direct relationship matrix: Create a matrix that displays the strength and direction of the causal connections between the different components. This matrix helps visualize the direct relationships between the factors. Indirect relationship matrix: Calculate the indirect relationships between the variables based on the direct relationships identified in the previous step. This step accounts for the indirect impacts that factors have on each other. Centrality evaluation: Assess the centrality of each factor in relation to the overall system it affects. This evaluation helps identify the most influential elements within the system. Causal loop diagram: Utilize a causal loop diagram to depict the causal relationships between the variables. This diagram aids in visualizing the interconnections and feedback loops within the system. Decision-making and interpretation: Analyze the results and interpret the findings. Decision-makers can utilize the provided information to prioritize actions, allocate resources, or address issues effectively. The DEMATEL method offers a quantitative and logical approach to evaluate complex decision-making situations. By enabling decision-makers to gain a comprehensive understanding of the relationships between factors and their relative importance, it supports more informed and effective decision-making processes. It is important to note that while this overview provides a general understanding of the DEMATEL method, specific adaptations or modifications may exist depending on the application or field of study. Researchers and practitioners may tailor the procedure to suit their specific needs and context. The Decision Making Trial and Evaluation Laboratory (DEMATEL) method is indeed a valuable approach for examining cause-and-effect relationships in complex systems. It provides decision-makers with a systematic framework to understand the key factors and their impacts within a system. Here is a step-by-step breakdown of the DEMATEL method: Problem identification: Clearly define the issue or situation that requires analysis and identify the key components or factors influencing the decision-making process. Causal relationship identification: Analyze the effects of each element on every other element within the system to determine the root causes of the problem. This involves understanding how the components interact and influence each other. Direct relationship matrix: Create a matrix that represents the strength and direction of the causal connections between the different components. This matrix helps visualize the direct relationships within the system. Indirect relationship matrix: Calculate the indirect relationships between variables based on the direct relationships established in the previous step. This matrix helps identify the cascading effects and dependencies within the system. Centrality evaluation: Determine the centrality of each element with respect to the overall system it affects. This step helps identify the most influential factors and their impacts on the entire system. Use a causal loop diagram to illustrate the causal relationships between variables. This diagram provides a visual representation of the interconnectedness of the components and aids in understanding the dynamics of the system. Decision-making and interpretation: Analyze the results and interpret the findings to gain a comprehensive understanding of the system. Decision-makers can use this information to prioritize actions, allocate resources, or address issues effectively. The DEMATEL method offers a quantitative and logical approach to evaluate complex decision-making situations. It enables decision-makers to grasp the connections between components and their relative importance, facilitating more informed and effective decision-making processes. It is important to note that specific adaptations or modifications of the DEMATEL method may be required based on the specific area of application or the complexity of the system being analyzed. However, the general procedure outlined above provides a solid foundation for utilizing the DEMATEL method in decision-making, management, engineering, and social science fields.

4. RESULT AND DISCUSSION

TABLE 1. Evaluation of Urban Public Transport Priority Performance

	First and last stop punctu	Transfer convenience	Public transpo	Morning and even	Public transport	SUM
First and last stop pur	0	1	4	2	2	9
Transfer convenience	3	0	2	1	1	7
Public transport site 5	2	1	0	3	2	8
Morning and evening	2	3	2	0	2	9
Public transport smar	2	1	1	2	0	6

Table 1 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

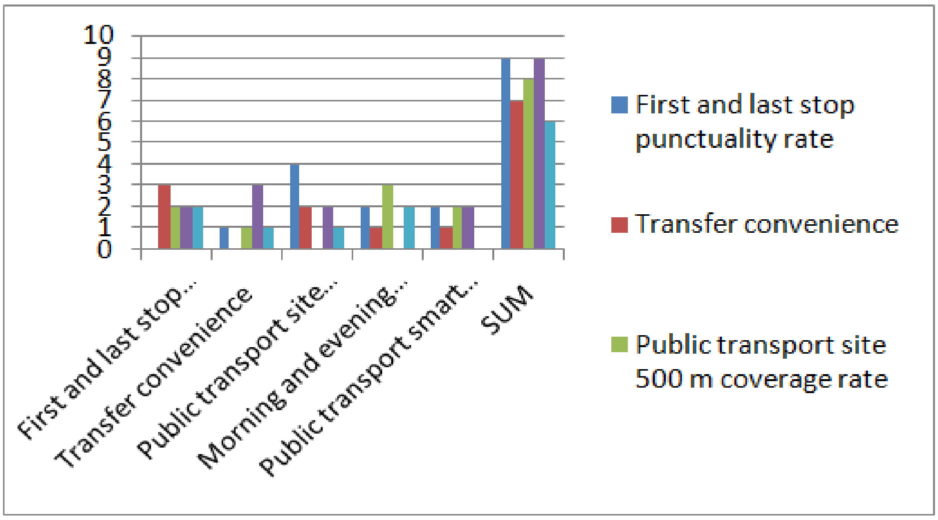

FIGURE 1 Evaluation of Urban Public Transport Priority Performance

Figure 1 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed**.**

TABLE 2. Normalization of direct relation matrix

Normalisation of direct relation matrix					
	First and last st	Transfer conveni	Public transp	Morning and even	Public transport smart card popularity rate
First and last stop	0	0.111111111	0.444444444	0.222222222	0.222222222
Transfer convenie	0.333333333	0	0.222222222	0.111111111	0.111111111
Public transport si	0.222222222	0.111111111	0	0.333333333	0.222222222
Morning and even	0.222222222	0.333333333	0.222222222	0	0.222222222
Public transport sı	0.222222222	0.111111111	0.111111111	0.222222222	0

Table 2 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 3. Calculate the total relation matrix

	Punctuality for both the first and last stop	Transfer convenience	Public transport site 500 m coverage rate	Morning and evening peak bus average operating speed	Public transport smart card popularity rate
Punctuality for both the first and last stop	0	0.111111111	0.444444444	0.222222222	0.222222222
Transfer convenience	0.333333333	0	0.222222222	0.111111111	0.111111111
Public transport site 500 m coverage rate	0.222222222	0.111111111	0	0.333333333	0.222222222
Morning and evening peak bus average operating speed	0.222222222	0.333333333	0.222222222	0	0.222222222
Public transport smart card popularity rate	0.222222222	0.111111111	0.111111111	0.222222222	0

Table 2 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

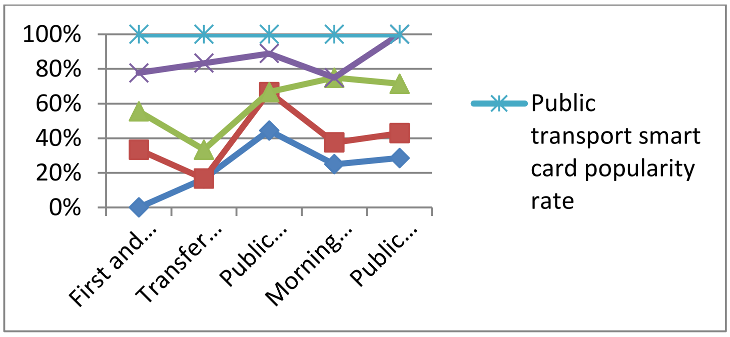

FIGURE 2 Calculate the total relation matrix

Figure 3 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 4 Total relation matrix

Total Relation matrix (T)						Ri
First and la	0.890832008	1.1006889	1.1683448	1.0381558	1.0107755	**5.208797**
Transfer co	1.081081081	0.8378378	0.963964	0.8648649	0.8738739	**4.6216216**
Public tran	0.749867515	0.7355591	0.6122593	0.8155803	0.6331037	**3.5463699**
Morning ar	0.788553259	0.9523052	0.8325384	0.6661367	0.7668256	**4.0063593**
Public tran	1.020137785	1.1950185	0.9365836	1.0317965	0.7682388	**4.9517753**
Ci	**4.530471648**	**4.8214096**	**4.5136902**	**4.4165342**	**4.0528175**	

Table 4 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

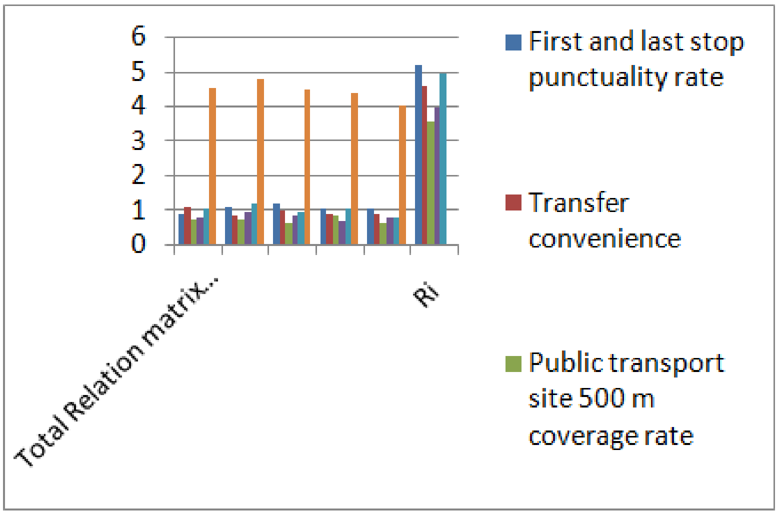

FIGURE 3. Total relation matrix

Figure 4 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 5. Identity matrix

I	I=	Identity matrix		
1	0	0	0	0
0	1	0	0	0
0	0	1	0	0
0	0	0	1	0
0	0	0	0	1

TABLE 5 shows identity matrix alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 6. y values

Y				
0	0.1818182	0.3636364	0.1818182	0.2727273
0.3636364	0	0.1818182	0.0909091	0.1818182
0.1818182	0.0909091	0	0.2727273	0.0909091
0.0909091	0.2727273	0.1818182	0	0.1818182
0.1818182	0.3636364	0.0909091	0.2727273	0

Table 6 shows y values alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 7. i-y values

I-Y				
1	-0.1818182	-0.3636364	-0.1818182	-0.2727273
-0.3636364	1	-0.1818182	-0.0909091	-0.1818182
-0.1818182	-0.0909091	1	-0.2727273	-0.0909091
-0.0909091	-0.2727273	-0.1818182	1	-0.1818182
-0.1818182	-0.3636364	-0.0909091	-0.2727273	1

Table 7 shows i-y values and alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 8. i-y-1 values

(I-Y)-1				
1.890832008	1.1006889	1.1683448	1.0381558	1.0107755
1.081081081	1.8378378	0.963964	0.8648649	0.8738739
0.749867515	0.7355591	1.6122593	0.8155803	0.6331037
0.788553259	0.9523052	0.8325384	1.6661367	0.7668256
1.020137785	1.1950185	0.9365836	1.0317965	1.7682388

Table 8 shows i-y-1 values and alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 9. Calculation of Ri+Ci and Ri-Ci

Calculation of Ri+Ci and Ri-Ci to get the cause and effect	Ri+Ci	Ri-Ci	Rank	Identity
Punctuality for both the first and last stop	9.7392687	0.6783254	1	cause
Transfer convenience	9.4430313	-0.199788	2	effect
Public transport site 500 m coverage rate	8.0600601	-0.9673203	5	effect
Morning and evening peak bus average operating speed	8.4228935	-0.4101749	4	effect
Public transport smart card popularity rate	9.0045928	0.8989578	3	cause

Table 9 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 10 Calculation of Ri+Ci and Ri-Ci to get the cause and effect

Calculation of Ri+Ci and Ri-Ci to get the cause and effect				
	Ri+Ci	Ri-Ci	Rank	Identity
First and last stop punctuality rate	9.7392687	0.6783254	1	cause
Transfer convenience	9.4430313	-0.199788	2	effect
Public transport site 500 m coverage rate	8.0600601	-0.9673203	5	effect
Morning and evening peak bus average operating speed	8.4228935	-0.4101749	4	effect
Public transport smart card popularity rate	9.0045928	0.8989578	3	cause

Table 10 shows alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.and Calculation of Ri+Ci and Ri-Ci to get the cause and effect

TABLE 11 T matrix

T matrix				
0.890832	1.100689	1.168345	1.038156	1.010775
1.081081	0.8378378	0.963964	0.8648649	0.8738739
0.7498675	0.7355591	0.6122593	0.81558	0.6331037
0.7885533	0.952305	0.8325384	0.6661367	0.7668256
1.020138	1.195019	0.936584	1.031797	0.7682388

Table 11 shows t matrix values and alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating.

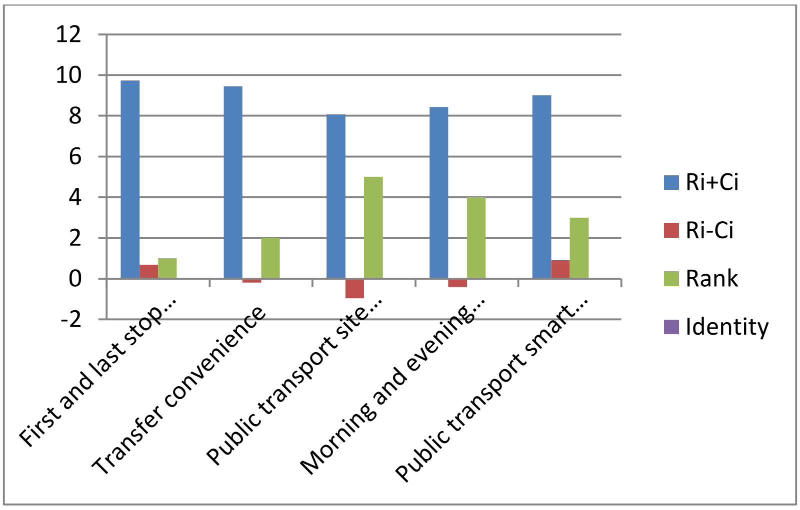

FIGURE 4. Calculation of Ri+Ci and Ri-Ci to get the cause and effect

Figure 5 showing alternative parameters Punctuality for both the first and last stop, transfer convenience, public transport site 500 mts coverage rate, morning and evening peak bus average operating speed.

TABLE 12 Rank

	Rank
Punctuality for both the first and last stop	1
Transfer convenience	2
Public transport site 500 m coverage rate	5
Morning and evening peak bus average operating speed	4
Public transport smart card popularity rate	3

Table 12 showing rank and Punctuality for both the first and last stop got first rank and public transport site 500m coverage rate got last rank.

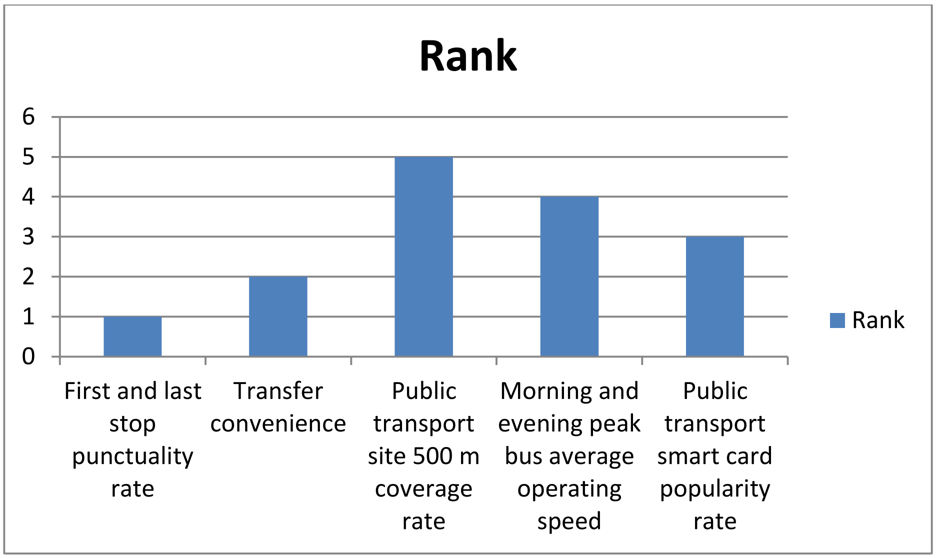

FIGURE 5. Rank

Figure 5 showing rank and Punctuality for both the first and last stop got first rank and public transport site 500m coverage rate got last rank

5. CONCLUSION

The evaluation of urban public transport priority performance is a crucial undertaking for improving the efficiency, sustainability, and effectiveness of public transportation systems in urban areas. By assessing key indicators such as travel time, reliability, passenger experience, modal shift, economic impact, environmental impact, equity, and integration, decision-makers and transportation authorities can gain valuable insights into the strengths and weaknesses of the system. The evaluation process allows for informed decision-making regarding investments, improvements, and policy changes to enhance public transport priority measures. It helps identify the impacts of these measures on urban mobility, sustainable development, economic benefits, equity, and social inclusion. Furthermore, the evaluation facilitates the identification of areas where technological advancements and innovations can be implemented to optimize public transport operations. Making Trial and (DEMATEL) method can be a useful approach for examining cause-and-effect relationships within complex urban transport systems. It provides decision-makers with a systematic framework to understand the key factors and their impacts, allowing for more effective decision-making processes. By prioritizing and continuously evaluating urban public transport priority performance, cities can create more efficient, reliable, and sustainable transportation systems. This, in turn, contributes to improved urban mobility, reduced congestion, decreased environmental impact, enhanced accessibility, and improved quality of life for residents. The evaluation process serves as a vital tool in the ongoing development and improvement of urban transport networks, ultimately creating more livable and connected cities. the evaluation of urban public transport priority performance is a crucial process that allows for the assessment of the effectiveness and efficiency of public transportation systems in urban areas. By examining cause-and-effect relationships and analyzing key indicators and metrics, decision-makers can gain valuable insights into the performance of public transport priority measures and make informed decisions to enhance urban mobility. The evaluation process helps identify the strengths and weaknesses of public transport priority measures, such as their impact on travel time reduction, reliability, passenger experience, modal shift, economic and environmental benefits, equity, and integration with other transportation modes. By understanding the causal relationships between various components, decision-makers can prioritize actions, allocate resources effectively, and address issues to improve the overall performance of urban public transport systems. The Decision Making Trial and Evaluation Laboratory method is one approach that can be utilized to examine cause-and-effect relationships in complex systems, providing decision-makers with a systematic framework to understand the key factors and their impacts. This method assists in visualizing and analyzing the interconnectedness of components and aids in effective decision-making. Ultimately, the evaluation of urban public transport priority performance supports the development of sustainable and reliable transportation systems, promotes modal shift from private vehicles to public transport, reduces traffic congestion, and contributes to a more livable and connected urban environment. By continuously evaluating and improving public transport priority measures, decision-makers can meet the evolving needs of communities and create transportation systems that are efficient, equitable, and environmentally friendly.

REFERENCE

[1]. Liu, Aijun, Zengxian Li, Wen-Long Shang, and Washington Ochieng. "Performance evaluation model of transportation infrastructure: Perspective of COVID-19." *Transportation Research Part A: Policy and Practice* 170 (2023): 103605.
[2]. Mohamed, Abdullahi Ali, Lawal Billa, and Ramadhansyah Putra Jaya. "Challenges of post-conflict urban transportation reconstruction in Mogadishu, Somalia." *Physics and Chemistry of the Earth, Parts A/B/C* 129 (2023): 103307.
[3]. Jiu, Xueyang, Peng Xiao, Bo Li, Yu Wang, and Aihong Kang. "Pavement Performance Investigation of Asphalt Mixtures with Plastic and Basalt Fiber Composite (PB) Modifier and Their Applications in Urban Bus Lanes Using Statics Analysis." *Materials* 16, no. 2 (2023): 770.
[4]. Jiu, Xueyang, Peng Xiao, Bo Li, Yu Wang, and Aihong Kang. "Pavement Performance Investigation of Asphalt Mixtures with Plastic and Basalt Fiber Composite (PB) Modifier and Their Applications in Urban Bus Lanes Using Statics Analysis." *Materials* 16, no. 2 (2023): 770.
[5]. Chatziioannou, Ioannis, Alexandros Nikitas, Panagiotis G. Tzouras, Efthimios Bakogiannis, Luis Alvarez-Icaza, Luis Chias-Becerril, Christos Karolemeas, Stefanos Tsigdinos, Pontus Wallgren, and Oskar Rexfelt. "Ranking sustainable urban mobility indicators and their matching transport policies to support liveable city Futures: A MICMAC approach." *Transportation Research Interdisciplinary Perspectives* 18 (2023): 100788.
[6]. Kuo, Yong-Hong, Janny MY Leung, and Yimo Yan. "Public transport for smart cities: Recent innovations and future challenges." *European Journal of Operational Research* 306, no. 3 (2023): 1001-1026.
[7]. Rezvani, Seyed MHS, Maria João Falcão, Dragan Komljenovic, and Nuno Marques de Almeida. "A Systematic Literature Review on Urban Resilience Enabled with Asset and Disaster Risk Management Approaches and GIS-Based Decision Support Tools." *Applied Sciences* 13, no. 4 (2023): 2223.
[8]. Guzman, Luis A., Victor A. Cantillo-Garcia, Julian Arellana, and Olga L. Sarmiento. "User expectations and perceptions towards new public transport infrastructure: evaluating a cable car in Bogotá." *Transportation* 50, no. 3 (2023): 751-771.
[9]. Alomari, Ahmad H., Taisir S. Khedaywi, Asalah A. Jadah, and Abdel Rahman O. Marian. "Evaluation of Public Transport among University Commuters in Rural Areas." *Sustainability* 15, no. 1 (2023): 312.
[10]. Bi, Lehua, Shaorui Zhou, Jianjie Ke, and Xiaoming Song. "Knowledge-Mapping Analysis of Urban Sustainable Transportation Using CiteSpace." *Sustainability* 15, no. 2 (2023): 958.
[11]. Son, Tim Heinrich, Zack Weedon, Tan Yigitcanlar, Thomas Sanchez, Juan M. Corchado, and Rashid Mehmood. "Algorithmic urban planning for smart and sustainable development: Systematic review of the literature." *Sustainable Cities and Society* (2023): 104562.
[12]. Dileep, M. R., and Francesca Pagliara. "Public Transport and Urban-Rural Tourism." In *Transportation Systems for Tourism*, pp. 85-101. Cham: Springer International Publishing, 2023.
[13]. Ham, Nam-Hyuk, and Ok-Kyung Yuh. "Performance Analysis and Assessment of BIM-Based Construction Support with Priority Queuing Policy." *Buildings* 13, no. 1 (2023): 153.
[14]. Mehregan, Mohammad Reza, Seyed Mostafa Razavi, and ANVARI MOHAMMAD REZA AKHAVAN. "Identification and evaluation of strategic decisions in gas industry using DEMATEL method." (2012): 49-65.
[15]. Li, Songrui, and Yitang Hu. "A Multi-Criteria Framework to Evaluate the Sustainability of Renewable Energy: A 2-Tuple Linguistic Grey Relation Model from the Perspective of the Prospect Theory." Sustainability 14, no. 8 (2022): 4419.
[16]. Jeong, Jin Su. "Biomass feedstock and climate change in agroforestry systems: Participatory location and integration scenario analysis of biomass power facilities." Energies 11, no. 6 (2018): 1404.
[17]. Hashemi-Dehaghi, Zahra, Hamed Karimi-Shirazi, and Masoomeh Nikbakht. "Identifying Effective Factors on Surgery Cancellation and Providing Effective Solutions Using Improved Management Strategies in a Selected Hospital: A Case Study." Health Information Management 16, no. 4 (2019): 176-183.

[18]. Vahedi, Manoucher, and Mohammad Mehdi Movahedi. "Evaluating and Prioritizing Asset Management Excellence Model Based on Critical Criteria Using the Combination of DEMATEL and ANP Techniques." Petroleum Business Review 2, no. 3 (2018): 56-65.

[19]. Devadoss, A. Victor, and A. Felix. "A Fuzzy DEMATEL approach to study cause and effect relationship of youth violence." International Journal of Computing Algorithm 2 (2013): 363-372.

[20]. Jeong, Jin Su, and David González-Gómez. "Assessment of sustainability science education criteria in online-learning through fuzzy-operational and multi-decision analysis and professional survey." Heliyon 6, no. 8 (2020): e04706.

[21]. Pandey, Mamta, Ratnesh Litoriya, and Prateek Pandey. "Application of fuzzy DEMATEL approach in analyzing mobile app issues." Programming and Computer Software 45 (2019): 268-287.