APPLICATION OF OPERATIONAL METHOD OF URBAN TRANSPORTATION MANAGEMENT SYSTEM FOR REMOVING THE TRAFFIC PROBLEMS IN THE LUCKNOW

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ABSTRACT

Public transport transit is the leading way of powered native mobile in metropolis. They are mostly via road, since commuter metro infrastructure facilities are existing just in the 23th metropolitan cities of Ahmedabad, Jaipur, Mumbai, New Delhi, Chennai, Nagpur, Surat, Kolkata, Hyderabad, Kozhikode, Madurai, Lucknow, Bangalore, Pune and Visakhapatnam, whereas local city bus facility area stay recognized on the way to run at a minimum 35 cities with a population of over 20 lakh. Transitional community transport modes like cycle rickshaws and temps take on significance in mid or town or small scale town cities. Although, the portion of public automobiles is insignificant in most metropolises when contrasted with customized vehicles, and bikes and vehicles represent more than 70-75 percent of the vehicle are generally found in huge or mid urban communities.

Intelligent Transportation Systems (ITS) is integral combination basic blend and utilization of PC framework, hardware, web of things and correspondence advancements and association arrangements in a coordinated technique is to give voyager data with the goal that it will build the welfare as well as efficiency of the surface transportation structures. These strategies comprise autos, drivers, explorers, street supervisors (like traffic police), and chiefs altogether interfacing with one another as well as use of computer system, electronics, internets stuffs and communication equipment so that these organization policies has an integrated system exists to make accessible tourist information so that it will escalation the security also effectiveness of the surface transportation structures. This project are consist of automobiles, car driver, travelers, lane operatives, and supervisors altogether intercommunicate through each other and their surroundings, as well as connecting through the complex infrastructure network to develop the well-being as well as maximum the usage of road systems in economical and efficient manner.

Presently governmental inaction in the field of Intelligent Transportation System (ITS) specifically in the India – is additional inspired via an accumulative attention on motherland security. Numerous of the planned ITS systems as well include surveillance of the roadways, whichever remains a main concern of homeland security. Promote, ITS could impact a revolutionary Abundant of the framework also forecasting tangled with ITS matches the requirement for homeland security frameworks.

Keywords: Vehicles, ITS Systems, Public Transport, Smart City, Population, Traffic Condition.

I. INTRODUCTION

Now in this technology revolution world era, the immigration on or after countryside to urban habitations has increased in a different way. Various locations in the biosphere's emerging space have urbanised without considerable motorization or suburban expansion. A minor portion of individuals can manage the cost of cars, all things considered vehicles incredibly upsurge stuffing in these multimodal transport plans. Other than emit huge of air exhaust, position a huge danger, and demolish perspective of imbalances in the general public. Most noteworthy thickness populace mass could be upheld by a multimodal system of climbing, bike, transportation, motorbikes, vehicles, and trains.

Urban Traffic Management System remains traffic regulator stand that aims to develop wide-ranging metropolitan traffic network. Trouble-free to controller and monitoring graphical management interface and combination with operative systems allows to join with various traffic information interface. Furthermore, Urban Traffic Management System synchronizes to the doing of multi-confronted metropolitan traffic the executives procedures to additional expansion traffic wellbeing, request, and effectiveness, decrease air...
contamination and energy utilization, and lead urban areas into metropolitan life standard of the 21st Century. Some of the operational methods are given below:

- Remote Communiqué
- Computational Technologies
- Drifting Car Data
- Detecting Technologies
- Inductive Loop Detection
- Video Surveillance and Vehicle Detection
- Bluetooth empowered Detection

II. OBJECTIVE OF RESEARCH

The main objectives of the study are:

1. To give perceptions into the idea of Intelligent Transportation System.
2. To examine the likely advantages and downside of giving information in rush hour gridlock framework.
3. To examine and assess the convenience of multi-specialist framework for demonstrating traffic framework.
4. To study and show the course decision conduct of street client on various time scale (from one day to another or inside day).
5. To set up the viability of the arranged examination practically speaking particularly in blend with information gave on the web.
6. To Improve security and Enhance versatility.

The total no. of registered motor vehicles are increasing continuously in city. In 2002, there were 556000 vehicles in city but in 2011, this no was increased to 1211000 vehicles now from last official data of 2020 there is around 3258400 vehicles. Hence it will require an enhanced transport network within city.

III. USES OF SMARTPHONE TO RECORD AND DECODED ROUGHNESS DATA FOR PAVEMENT CONDITION

Cell phone based roughness estimation is utilized to track down and gather unpleasantness information thinking about the subsidizing imperatives of nearby street offices. Rather than utilizing exact roughness estimating hardware still, cell phone based applications give a precise estimation.

The detail analysis and decoded of comfort and psychology pain related data regarding journey information was changed over into a PCI file. While ascertaining the PCI, abstract an incentive for seriousness condition is thought of and in view of the thickness, the PCI computation method is proceeded. It was experimental determined that PCI has a solid connection with IRI for the chose street network as displayed.
The connection established is created with IRI is 130 cm/km to 136 m/km and the determined PCI esteem changes from 8.2 to 100. The non-direct relapse model utilizing the sigmoidal work has addressed the best-fitted capacity with an changed factor of assurance for IRI with PCI and shown.
But due to initially phase of execute these smartphone data captured and decode the data and interpreted data to predicted the road condition and theirs types of defects its has some limitation its results not so excellent for rigid pavements as compare to flexible pavement. Sometimes when there is tight traffic jam in urban condition especially this smartphone system which evaluate the condition of road not worked properly due to freeze condition of gravity sensors of phone.

![Graph](image_url)

**Figure 4:** IRI behavior with distress extent functions based on area recorded.

Three models created by presenting consolidate impacts of troubles on IRI by multivariable relapse examination and it gave sound connections to asphalt different age classes. In addition, the connections show measurable importance for noticed misery, for example, ravelling, edge hole and breaking.

### IV. CALCULATION OF TOTAL COST

Total capital cost is calculated on the basis of following data –

<table>
<thead>
<tr>
<th>Data Item</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buses.</td>
<td>41</td>
</tr>
<tr>
<td>Routes.</td>
<td>3</td>
</tr>
<tr>
<td>Bus Stops.</td>
<td>18</td>
</tr>
<tr>
<td>Bus Depots.</td>
<td>1</td>
</tr>
<tr>
<td>Bus Terminal.</td>
<td>3</td>
</tr>
</tbody>
</table>
4.1 Cost of GPS and GIS Units

Table 1: Overall Infrastructure of UPSRTC Relevant to Project

<table>
<thead>
<tr>
<th>S No</th>
<th>Description</th>
<th>Unit Price</th>
<th>Licenses</th>
<th>Total (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Integration of application software with GIS road network dataset of Lucknow</td>
<td>NA</td>
<td>Built into GPS System</td>
<td>Built into GPS System</td>
</tr>
<tr>
<td>2</td>
<td>Map Extreme Java Version 4.7.0</td>
<td>1,000,000</td>
<td></td>
<td>1,000,000</td>
</tr>
<tr>
<td>3</td>
<td>Geo fencing of routes by physical survey and integration with the Geo Fencing module</td>
<td>500,000</td>
<td>At Actuals</td>
<td>500,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total GIS Software Cost</strong></td>
<td></td>
<td></td>
<td><strong>15,000,000</strong></td>
</tr>
</tbody>
</table>

Table 2: Vehicle Mounted Unit and Associated Software

<table>
<thead>
<tr>
<th>S No</th>
<th>Description</th>
<th>Unit Cost (Rs)</th>
<th>Quantity</th>
<th>Total (Rs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Computers/Workstations with 17 inches Monitor</td>
<td>45,000</td>
<td>1</td>
<td>45,000</td>
</tr>
<tr>
<td>2</td>
<td>Printer</td>
<td>15,000</td>
<td>1</td>
<td>15,000</td>
</tr>
<tr>
<td>3</td>
<td>UPS</td>
<td>30,000</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>4</td>
<td>A/C capacity</td>
<td>25,000</td>
<td>1</td>
<td>25,000</td>
</tr>
<tr>
<td>5</td>
<td>Application Software for Computers</td>
<td>100,000</td>
<td>1</td>
<td>100,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total Cost for 1 Depot</strong></td>
<td></td>
<td></td>
<td><strong>21,50,000</strong></td>
</tr>
</tbody>
</table>
### Table 3: GIS Software and Components

<table>
<thead>
<tr>
<th>S No</th>
<th>Description</th>
<th>Unit Cost</th>
<th>Quantity</th>
<th>Total ( Rs. )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Servers (17 boxes), Software License and Network Costs</td>
<td>175,000</td>
<td>2</td>
<td>350,000</td>
</tr>
<tr>
<td>a)</td>
<td>Edge Server</td>
<td>175,000</td>
<td>2</td>
<td>350,000</td>
</tr>
<tr>
<td>b)</td>
<td>Web Server</td>
<td>175,000</td>
<td>2</td>
<td>350,000</td>
</tr>
<tr>
<td>c)</td>
<td>Database Server</td>
<td>1,700,000</td>
<td>2</td>
<td>3,400,000</td>
</tr>
<tr>
<td>d)</td>
<td>Application Server</td>
<td>720,000</td>
<td>2</td>
<td>1,440,000</td>
</tr>
<tr>
<td>e)</td>
<td>Directory Server</td>
<td>175,000</td>
<td>1</td>
<td>175,000</td>
</tr>
<tr>
<td>f)</td>
<td>GSM/GPRS Server</td>
<td>385,000</td>
<td>1</td>
<td>385,000</td>
</tr>
<tr>
<td>g)</td>
<td>Reporting Server</td>
<td>175,000</td>
<td>1</td>
<td>175,000</td>
</tr>
<tr>
<td>h)</td>
<td>Integration Server</td>
<td>720,000</td>
<td>1</td>
<td>720,000</td>
</tr>
<tr>
<td>i)</td>
<td>GIS Server</td>
<td>385,000</td>
<td>1</td>
<td>385,000</td>
</tr>
<tr>
<td>j)</td>
<td>SAN Array 2Tb</td>
<td>650,000</td>
<td>1</td>
<td>650,000</td>
</tr>
<tr>
<td>k)</td>
<td>Storage Manager</td>
<td>385,000</td>
<td>2</td>
<td>770,000</td>
</tr>
<tr>
<td>l)</td>
<td>VAT 4% on the above</td>
<td></td>
<td></td>
<td>352,000</td>
</tr>
<tr>
<td>m)</td>
<td>Packaging &amp; delivery Charges</td>
<td></td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td>n)</td>
<td>Software licenses</td>
<td></td>
<td></td>
<td>20,000,000</td>
</tr>
<tr>
<td>o)</td>
<td>Network Components</td>
<td></td>
<td></td>
<td>1,650,000</td>
</tr>
<tr>
<td>p)</td>
<td>Network Installation</td>
<td></td>
<td></td>
<td>67,000</td>
</tr>
<tr>
<td>q)</td>
<td>Cost of design, sizing, system architecture installation, commissioning, testing</td>
<td></td>
<td></td>
<td>13,616,000</td>
</tr>
<tr>
<td>2.</td>
<td>Access control facilities at server rooms</td>
<td>100,000</td>
<td>2</td>
<td>200,000</td>
</tr>
<tr>
<td>3.</td>
<td>Application Software for ITS</td>
<td>5,000,000</td>
<td>1</td>
<td>5,000,000</td>
</tr>
<tr>
<td>4.</td>
<td>Workstations/Computers</td>
<td>50,000</td>
<td>4</td>
<td>200,000</td>
</tr>
<tr>
<td>5.</td>
<td>Dot-matrix Printer</td>
<td>10,000</td>
<td>2</td>
<td>20,000</td>
</tr>
<tr>
<td>6.</td>
<td>Ink jet Printer/Scanner</td>
<td>30,000</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>7.</td>
<td>Plotter</td>
<td>40,000</td>
<td>1</td>
<td>40,000</td>
</tr>
<tr>
<td>8.</td>
<td>UPS (servers and computers) 20KVA with 15 minutes backup</td>
<td>1,000,000</td>
<td>1</td>
<td>1,000,000</td>
</tr>
<tr>
<td>9.</td>
<td>System software for computers</td>
<td>20,000</td>
<td>4</td>
<td>80,000</td>
</tr>
<tr>
<td>10.</td>
<td>Generators (30KVA)</td>
<td>900,000</td>
<td>1</td>
<td>900,000</td>
</tr>
<tr>
<td>11.</td>
<td>Windows A/C – capacity 4 tons</td>
<td>75,000</td>
<td>4</td>
<td>300,000</td>
</tr>
</tbody>
</table>
### Table 4: Depot Infrastructure Requirements

<table>
<thead>
<tr>
<th>S No</th>
<th>Description</th>
<th>Unit Cost (Rs)</th>
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<tr>
<td>3</td>
<td>UPS</td>
<td>30,000</td>
<td>1</td>
<td>30,000</td>
</tr>
<tr>
<td>4</td>
<td>A/C- capacity</td>
<td>25,000</td>
<td>1</td>
<td>25,000</td>
</tr>
<tr>
<td>5</td>
<td>Application Software for Computers</td>
<td>100,000</td>
<td>1</td>
<td>100,000</td>
</tr>
</tbody>
</table>

**Total Cost for 1 Depot** 21,50,000

### 4.2 Operating Costs:

**Table 5: Operating Costs for ITS project (in Rs. Lakhs)**

<table>
<thead>
<tr>
<th>Operating Cost</th>
<th>Communication to Vehicles</th>
<th>Bus Stop Display &amp; Communication</th>
<th>Communication Links to Central Station</th>
<th>Facilities and Additional Monitoring Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>10.50</td>
<td>1.92</td>
<td>10.00</td>
<td>98.16</td>
<td>120.58</td>
</tr>
<tr>
<td>Year 2</td>
<td>12.05</td>
<td>1.92</td>
<td>10.00</td>
<td>98.16</td>
<td>122.13</td>
</tr>
<tr>
<td>Year 3</td>
<td>13.86</td>
<td>1.92</td>
<td>10.00</td>
<td>98.16</td>
<td>123.94</td>
</tr>
<tr>
<td>Year 4</td>
<td>13.86</td>
<td>1.92</td>
<td>10.00</td>
<td>98.16</td>
<td>123.94</td>
</tr>
<tr>
<td>Year 5</td>
<td>13.86</td>
<td>1.92</td>
<td>10.00</td>
<td>98.16</td>
<td>123.94</td>
</tr>
</tbody>
</table>

4.3 Total Cost:
- Total capital Cost = Rs.5,64,76,700
- Total Operating Cost = Rs.1,20,58,000
- **Total Cost = Rs.6,85,34,700**

4.4 Calculation of Total Benefits:

The benefits of the project are measured on three major revenue streams which are:

a) Passenger Shift
b) Advertisement Revenues
c) Fuel Savings

**4.4.1 Benefits Due to Passenger Shift:**

Benefits due to passenger shift has been calculated by assuming average modal shift of 12% of total passengers travelling on the three selected routes. The total no. of trips are 8 per day and average no. of passengers are 60 per trip. Hence the total no. of passengers on three routes are 26,000 per day.

But according to experts in public transport field above figures were unrealistic from past experience and hence rate of shift has been scaled down to more realistic level. Thus final rate of shift is assumed as following -
Table 6: Total Target Population for Shifting to ITS Bus

<table>
<thead>
<tr>
<th>Mode of Transport</th>
<th>% Shift Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Wheelers</td>
<td>17.66%</td>
</tr>
<tr>
<td>3 Wheelers</td>
<td>12.50%</td>
</tr>
<tr>
<td>4 Wheelers</td>
<td>7.50%</td>
</tr>
</tbody>
</table>

4.4.2 Total Benefits
Benefit from modal shift = Rs.62,40,000
Benefit from bus advertisements = Rs. 1,23,00,000
Benefit from fuel savings = Rs. 1,57,98,550

Total Benefit = Rs. 3,43,38,550

4.5 Road classification based on smartphone roughness recorded data
The impact of different types of distress on pavement roughness, as well as the ability of IRI to detect the presence of distress on the pavement surface, are also explored in this study. It is discovered that ravelling and potholes have a greater association with IRI edge breaks and edge gap. The other important factor is the study's main finding is the effect of the edge gap on pavement. Harshness on Urban roads with narrow carriageways models created by combining the affects of multivariable regression study on IRI and it produced various age categories of pavement have different sound connections.

V. CONCLUSION
The quickly expanding vehicle populace in urban communities requires execution of new vehicle network in present day public vehicle situation. Insightful Transportation Systems (ITS) is a set up course to determine or if nothing else limit these traffic issues. It make frameworks more secure, productive, dependable and harmless to the ecosystem, without fundamentally having to genuinely modify existing foundation.

Progressed Public Transportation Systems (APTS) include applications like programmed vehicle area (AVL), which allow travel vehicles, whether they are on the road or on the rails, to report their current location, allowing traffic activity administrators to maintain a constant view of the situation with all resources in the public transportation framework. APTS makes public transportation a more enticing option for suburbanites by improving their perception of the appearance and departure status of buses and trains. Smartphone roughness data collection assessment is used to establish a economical approach for collecting data while keeping in mind the financing limits of local agencies. Instead of deploy high cost roughness measuring equipment, smartphone-based solution provide an exact measurement by applied some correction in data varience.

Smartphone based data collection slightly underestimated the realistic IRI value, but uncertainty of the data rectified within the allowed tolerance range, so the smartphone-based recorded roughness collection system is a potential economical approach meant for local agencies to collect roughness data of Road network-level.
Applying ITS technologies to public transportation network of a city deliver five key classes of benefits –

- Expanding Pedestrian and Driver wellbeing.
- Improving the transportation organization's operational performance
- Improving individual portability and accommodation.
- Delivering natural advantages.
- Computerized estimation of road path and plot on smart device map
- Helping productivity and extending financial and business development.

VI. REFERENCES

