

Strategic Optimization Decision Priority Portal based Transportation Decision Support System for Indian cities

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Abstract: -The demand of transportation system of Indian cities is continuously increasing due to rapid rise in population, industrialization, education infrastructure and desire to travel; and is now a solid backbone for the survival and development of a modern society. Due to population and vehicle population growth, frequent road accidents, heavy transport taxes, rising cost of petrol and diesel, high road pollution, changes in travel patterns, poor and inadequate maintenance of roads, there is an urgent need for the strategic optimization of decision priority areas of Indian million plus cities to improve and manage their current poor transportation system. In this paper, a Strategic Optimization Decision Priority Portal based Transportation Decision Support System (SODP-TDSS) is designed and developed for the strategic optimization of transportation decision priority areas of Indian million plus cities. The SODP-TDSS is comprised of six main sub-systems: Transportation Model Base Management Sub-system, Transportation Data Base Access and Management Sub-system, Strategic Optimization Decision Priority Portal based Optimization Vision Technology Base, Central Transportation Vision Navigator Board, Dialog Management Sub-system and Transportation Decision Making and User Desk. The Genetic Algorithm based portal uses natural selection and mechanics of natural genetics to generate and select optimized strategic traffic and transportation critical factors with their respective optimized weights. The developed SODP-TDSS generated total 21 most prioritized strategic optimal traffic and transportation critical factors for Indian million plus cities with their respective optimized weights W_{TTCF} for all 9 identified strategic transportation decision priority areas with their specificity and sensitivity between 93-98 % and 84-92% respectively and the mean accuracy of developed SODP-TDSS was 96%.

Keywords: Transportation Decision Support System, Genetic Algorithm, Transportation System, Mathematical Optimization, Transportation Decision Priority Areas.

1. Introduction

Indian Transportation system is now a solid backbone for the survival and development of the traditional Indian society and is the main veins and arteries through whose channels every improvement and development take circulation and is now an essential requirement for the nourishment and rapid progress and its demand is continuously increasing due to increase in population, industrialization, education infrastructure, urban development and tourism. Due to changes in travel patterns and population growth, inadequate and poor maintenance of roads, frequent accidents, heavy transport taxes, and the rising cost of petrol and diesel, there is an urgent need for the strategic optimization of Transportation Decision Priority Areas to manage the current Indian transportation system.

Transportation Decision Support System (TDSS) is an interactive support system to support the identification, investigation, mathematical formulation, evaluation and optimal solution of semi-structured or unstructured transportation decision optimization problems by combining the know-how of transportation decision making technologies, communication and information technologies and latest computer technologies by transportation system logistic decision maker in a user friendly system platform and has drawn increased attention as one of the emerging transportation system decision-making tools and transportation decision optimization service delivery

vehicles running on the transportation information highway. TDSS is an integrated sets of tangible and intangible transportation information for strategic, tactical and operational planning levels that are designed to supplement a system users, transportation planners, transportation engineers, traffic administrators, transportation system decision makers and transportation system expert's insight and personal rich knowledge base during transportation system decision making and problem-solving activities. Sun et al. [8] demonstrated a decision support system for transportation based on dynamic data-driven applications systems to make the system smarter. Glock [4] developed a decision support system for the management of returnable transport items which include reusable wrapping materials, like trays, boxes, or pallets with closed-loop supply chains. From car driver's angle, a web-based multiple criteria decision support system using a two-phase optimization by genetic algorithm was designed by Petrillo et al. [6]. Using multiple objective genetic algorithm, Papatzikou and Stathopoulos [5] developed a decision support system to optimize traffic control of a transportation system.

The genetic algorithm is a very robust, powerful, and most efficient type of evolutionary algorithm for intelligent searching; has integral best parallel capacities for complex or loosely-defined decision problems having single and multiple objectives with large search space, alternatives, and factors; iterative better solution method for real life decision problems without a little derivative evidence; efficient and fast approach having the inductive nature and quick scan feature with optimal solutions. Saharkar and Wanjari [7] presented a genetic algorithm for school bus transportation problem to minimize the time. To solve traveling salesman problem, Abbasi et al. [1] developed an innovative solution procedure of genetic algorithm. To obtain the global optimum solution of hazardous pollution transportation problem without premature convergence, Zhang, Guo and Yan [9] presented a hybrid genetic algorithm method. Using genetic algorithm, a complete automatic method was proposed by Chiappone et al. [2] for calibration of a traffic model. To optimize flow of urban traffic, Dezani et al. [3] presented a new methodology based on genetic algorithm.

Transportation Decision Support System (TDSS) in India, is at present in its infancy state and hence there is an urgent need to design and develop a transportation decision support system having strategic optimization decision priority portal for the strategic optimization of transportation decision priority areas to suit the Indian transportation scenario for improving and managing the quality of current poor traffic and transportation system of Indian million plus cities to basically create an interoperable support system and offer an automated hi-tech decision management platform to pave way to embrace such decision technologies for the operational efficiency and upgrading the present Indian million plus cities traffic and transportation system.

In this paper, a Strategic Optimization Decision Priority Portal based Transportation Decision Support System (SODP-TDSS) is designed and developed for the strategic optimization of transportation decision priority areas to improve and manage the current poor traffic and transportation system of Indian million plus cities. The developed SODP-TDSS provides a comprehensive structured vision communication and support system framework to strategically optimize the transportation decision priority areas by generating and identifying strategic optimal traffic and transportation critical factors with their respective optimized weights to reduce and manage the different traffic and transport related crucial problems of the transportation system of Indian million plus cities. Transportation decision support system for the strategic decision making and optimization of transportation decision priority areas of Indian million plus cities are almost negligible in the literature and very few TDSS for India cities are explored, therefore, to fill this research gap, an effort is being made in this research work to design and develop a SODP-TDSS for Indian million plus cities.

2. Strategic Optimization Decision Priority Portal based Transportation Decision Support System

This section presents the design and development of Strategic Optimization Decision Priority Portal based Transportation Decision Support System (SODP-TDSS) having a synergetic approach to achieve the aim of providing the queries support and decision exchange functions, essential for retrieving vast traffic and transportation information resources, and generating and identifying critical strategic optimal traffic and transportation critical factors, for real life interaction among system users, transportation system decision-makers and transportation system experts for the strategic optimization of transportation decision priority areas of million plus cities of India. The SODP-TDSS is comprised of six main sub-systems: Transportation Data Base Access and Management Sub-

system, Transportation Model Base Management Sub-system, Strategic Optimization Decision Priority Portal based Optimization Vision Technology Base, Central Transportation Vision Navigator Board, Dialog Management Sub- system, and Transportation Decision Making-User

2.1 Transportation Data Base Access and Management Sub- System

The designed and developed SODP-TDSS utilizes a relational Transportation Data Base Access and Management Sub-system for reducing computation time and effort for supportive repetitive interaction processes. The main task of the Transportation Data Base Access and Management Sub-system is the data simplification, data preparation, and data pre-processing of input traffic and transportation data of transportation decision priority areas of million plus cities of India and also control and verify the bulk of traffic and transport data required by the Genetic Algorithm Module based Strategic Optimization Decision Priority Portal of Optimization Vision Technology Base. The relational database, which is comprised of daily traffic and transport analysis reports as reported by traffic and transportation agencies after pre-processing provides reliable data for necessary strategic framework.

2.2 Transportation Model Base Management Sub-system

The Transportation Model Base Management Sub-system accepts the traffic and transportation data from the Transportation Data Base Access and Management Sub-system; computes the value using Genetic Algorithm Module based Strategic Optimization Decision Priority Portal of Optimization Vision Technology Base; and displays the results through Central Transportation Vision Navigator Board to Dialog Management Sub-system for the strategic optimization of transportation decision priority areas of million plus cities of India.

2.3 Optimization Vision Technology Base

The futurologistic and multi criteria approach of Optimization Vision Technology Base comprising of Genetic Algorithm Module based Strategic Optimization Decision Priority Portal provides an effective strategic vision dimension to deal with different traffic and transport related crucial complex problems of the transportation system of Indian million plus cities. The Genetic Algorithm Module based Strategic Optimization Decision Priority Portal provides high levels of mutual affinity and fast strategic decision-making in a virtual meeting environment. Optimization Vision Technology Base provides structured quality Strategic Optimization Decision Priority sub-system and relies on effective communication among system users, transportation system decision-makers, transportation system researchers and transportation system experts.

2.3.1 Genetic Algorithm Module

The Genetic Algorithm Module of Optimization Vision Technology Base is designed and developed using Genetic Algorithm, which is a subset of evolutionary computation, and uses natural selection and mechanics of natural genetics in the area of mathematical optimization to obtain global optimum in a phase space. The Genetic Algorithm Module identifies and determines strategic optimal Traffic and Transportation Critical Factors (TTCF) with their respective optimized weights W_{TTCF} for the strategic optimization of Transportation Decision Priority Areas (TDPA) to reduce and manage the different traffic and transport related crucial problems of the transportation system of Indian Million Plus Cities (IMPC).

The main steps of Genetic Algorithm Module of Optimization Vision Technology Base are: generation of set of solutions known as population, evaluation of the chromosomes (fitness function) and operations of the module. The procedure of module begins with random generation of population of chromosomes and then fitness of all chromosomes is evaluated and three steps: reproduction operation, crossover operation and mutation operation, is followed to generate new population until the generation of new population is over. Then again evaluate newly generated population and finally test for the end condition. If stopping rule is satisfied, stop, otherwise iteratively repeat these steps, and evaluate till stopping criterion is. Satisfied.

If the decision target has n different types of Transportation Decision Priority Areas (TDPA) for the sample size: Indian Million Plus Cities (IMPC) and the numbers of strategic Traffic and Transportation Critical Factors (TTCF)

for each Transportation Decision Priority Areas (TDPA) is m , then a chromosome (Ch) can be represented by a matrix $[g_{uj}]$ having $(m \times n)$ real number. The gene $g_{ij} \in [-1, +1]$ of the chromosome represents the i th strategic Traffic and Transportation Critical Factors (TTCF) of the j^{th} Transportation Decision Priority Areas (TDPA) for Indian Million Plus Cities (IMPC) and the negative or positive sign with the value of the gene specify the mutual relationship between the strategic TTCF and its corresponding TDPA for Indian Million Plus Cities (IMPC). The fitness function of chromosome represents the quality performance of different chromosome and also evaluates its closeness with the solution i.e., it represents the number of correct classifications across the entire sample size.

For the sample size: Indian Million Plus Cities (IMPC), an occurrence O_i ($1 \leq i \leq U$) with total U occurrences are represented by $(o_{i1}, o_{i2}, \dots, o_{ik}, \dots, o_{im})$, where o_{ik} ($1 \leq k \leq m$) denotes the value of the strategic TTCF k in occurrence O_i . For the occurrence O_k , the value of Classification Result (CR_i) of a chromosome is denoted by: $CR_i = \text{Max} \{n_{ik} \mid n_{ik} = \sum_{t=1}^m o_{it} \cdot Ch_{tk}, 1 \leq k \leq n\}$. Now for the occurrence O_i , if the value of Ground Truth is matching with the Classification Result, then the Indication Function (I_i) is represented by one; otherwise by zero. Thus, for chromosome, its fitness function value is obtained as:

$$f(Ch) = \frac{\sum_{i=1}^U I_i}{U}$$

The Genetic Algorithm Module is basically based on amalgamation of three operations: selection, crossover and mutation operation. The main criteria of selection operation is the fitness of chromosomes and the operation should ensure that only fittest chromosomes have more probability to survive. Here, the population has M chromosomes and the SelectionProbability for each chromosome Ch_j is derived using:

$$P_s(Ch_j) = \frac{f(Ch_j)}{\sum_{k=1}^M f(Ch_k)}$$

Roulette Wheel Selection method provides a better reproductive chance to reproduce for populations having high fitness value and is used in this Module to select the chromosome Ch_j using uniformly random number $R_n \in [0, 1]$ which satisfies the following condition:

$$\sum_{k=0}^M P_s(Ch_j) < R_n \leq \sum_{k=0}^M P_s(Ch_j), \text{ where } P_s = 0 \text{ for } k = 0$$

In this Module, the following special crossover operation is employed for selecting TTCF:

Let α is an $m \times n$ stochastic matrix and the value of every element should lie randomly in the interval $[0,1]$. Ch_1 and Ch_2 are two selected parent chromosomes, and performing crossover operation they generate Ch'_1 as first and Ch'_2 as second new chromosome using Crossover Probability P_c :

$$Ch'_1 = \alpha \cdot Ch_1 + (1 - \alpha) \cdot Ch_2 \quad \text{and} \quad Ch'_2 = (1 - \alpha) \cdot Ch_1 + \alpha \cdot Ch_2$$

For performing mutation operation to select strategic optimal TTCF in this Module, a random substitution technique is used. In this technique, the chromosome that participate in mutation is replaced by a new randomly generated chromosome using Mutation Probability P_m . The model then selects prioritized strategic optimal TTCF from these generated strategic optimal TTCF.

2.4 Central Transportation Vision Navigator Board

Central Transportation Vision Navigator Board of the designed and developed SODP-TDSS is based on independent and interactive knowledge-based agents such as data completion, data analysis, information visualization, prediction and control functions and is a central vision navigator black board problem solving architecture. Central Transportation Vision Navigator Board is basically a visual communication medium and provides a navigation facility for viewing the generation of prioritized course of action in real time. Genetic Algorithm Modulebased Strategic Optimization Decision Priority Portal of Optimization Vision Technology Base, and Transportation Data Base Access and Management Sub-system interact with Central Transportation Vision Navigator Board and visualize a representation of the traffic and transportation problems structure for the million plus cities of India. The modular and distributed computing environment of Central Transportation Vision

Navigator Board allows a kind of parallel processing and reasoning with the integration of Dialog Management Sub- system and Transportation Decision Making-User Desk and is well suited for real-time information and visual presentation of decision to System Users, Transportation System Decision Makers and the Transportation System Experts. The visual presentation of Central Transportation Vision Navigator Board assists cognition and early decision-making.

2.5 Dialog Management Sub-system

The Dialog Management Sub-system captures the system users, transportation system decision makers, and transportation system experts' preferences, degree of expertise, and skills and then receives and interprets their input, which is conveyed to Central Transportation Vision Navigator Board. The Dialog Management Sub-system is designed for the system users, transportation system decision makers and transportation system experts of the Indian transportation system with a variety of decision-making needs related to traffic and transportation problems of the million plus cities of India. The system users are able to select their area of interest Transportation Decision Priority Areas.

The Dialog Management Sub-system capabilities are broadly classified into two categories: Transportation Decision Exchange Server and Transportation Queries Support Server due to variety of system users with different decision-making tasks. Transportation Decision Exchange Server supports the Transportation Decision Priority Areas decision-making tasks and allows the system users to generate a number of displays from the data available in the SODP-TDSS, into the pre-defined format while Transportation Queries Support Server allows adhoc retrieval of traffic and transportation problem information of the million plus cities of India. The processed data from the Transportation Data Base Access and Management Sub- system is accepted as the input data for Optimization Vision Technology Base which uses Genetic Algorithm Module based Strategic Optimization Decision Priority Portal having several capabilities, and after the interaction the output results are first transmitted in real-time to the Central Transportation Vision Navigator Board having central vision navigator black board problem solving architecture, and finally through Transportation Decision Exchange Server or Transportation Queries Support Server for analysis and decision to Transportation Decision Making-User Desk.

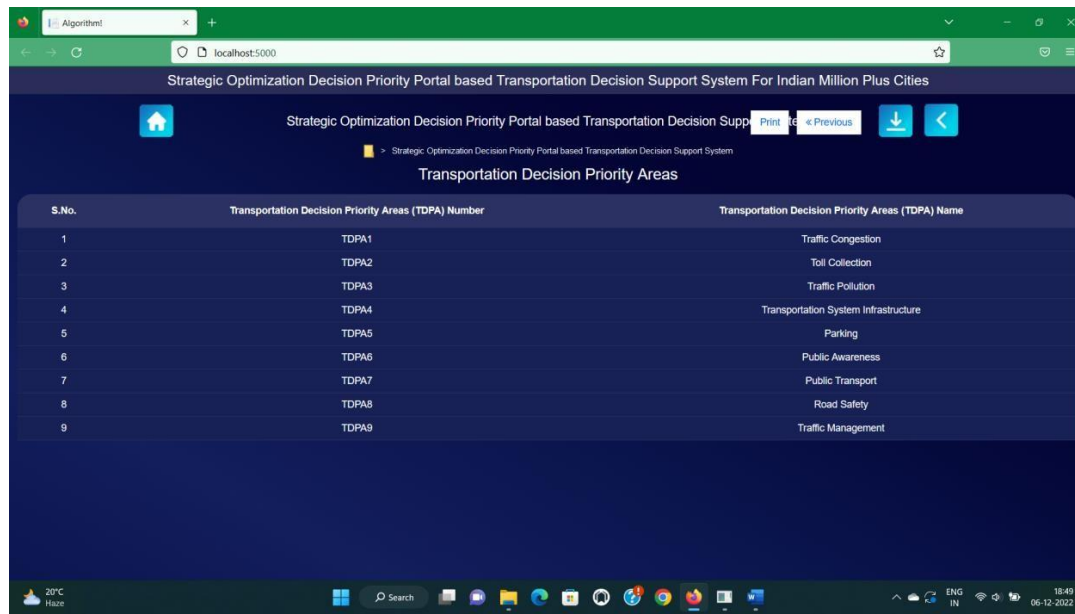
2.6 Transportation Decision Making – User Desk

The Transportation Decision Making-User Desk is primarily intended to be used by System Users, Transportation System Decision Makers and the Transportation System Experts and plays an important role in the strategic planning, management control, operational planning and transaction processing to generate and identify critical strategic optimal Traffic and Transportation Critical Factors with their respective optimized weights WTTCF for the strategic optimization of transportation decision priority areas to reduce and manage the different traffic and transport related crucial problems of the transportation system of Indian million plus cities. Transportation Decision Making-User Desk not only supports transportation executives, managers, and analysts at strategic, tactical, and operational levels but also supports additional users at lower hierarchical levels and other staff members responsible for lower-level analysis, inputting data, and keeping the transportation database up to date and its major function is to support the three common activities - retrieval, sharing and use of information.

There is a great need for expertise sharing between transportation system decision makers and transportation system experts which is very much essential when a complex decision problem like traffic and transport related crucial problems of the transportation system of Indian million plus cities is to be divided into transportation decision priority areas, each of which is then solved by expert groups within the team for effective decision-making. The main factor in an effective and efficient transportation decision making, is the need for healthy interaction between the system users, transportation system decision makers, and transportation system experts during the decision making process to focus on quality based information visualization. TDMU-Desk is thus mainly responsible for detecting traffic and transportation problems of millennium cities of India, elaborating on the nature of the problem, generating possible decision solutions, evaluating potential decision solutions, and formulating strategies for implementing decision solutions by using the capabilities of Genetic Algorithm Module based Strategic Optimization Decision Priority Portal of Optimization Vision Technology Base.

3. Result and Discussion

In this research study, a total 53 Indian Million Plus Cities (IMPC) were selected to reduce and manage the different traffic and transport related crucial problems of their transportation system. Eminent Indian transportation system researchers and transportation experts helped in categorizing 9 Transportation Decision Priority Areas (TDPA) (Figure 1) of these 53 IMPC, which are continuously facing one or another type of severe traffic and transport related complex problems due to lot of technical or nontechnical factors.



S.No.	Transportation Decision Priority Areas (TDPA) Number	Transportation Decision Priority Areas (TDPA) Name
1	TDPA1	Traffic Congestion
2	TDPA2	Toll Collection
3	TDPA3	Traffic Pollution
4	TDPA4	Transportation System Infrastructure
5	TDPA5	Parking
6	TDPA6	Public Awareness
7	TDPA7	Public Transport
8	TDPA8	Road Safety
9	TDPA9	Traffic Management

Figure 1: Transportation Decision Priority Areas (TDPA)

These categorized strategic Transportation Decision Priority Areas (TDPA) supported the creation of top-level decision target thrusts that should be addressed for traffic and transport related crucial problems. The developed SODP-TDSS provided a comprehensive structured vision communication and support system framework to strategically optimize the Transportation Decision Priority Areas (TDPA) by generating and identifying 26 strategic Traffic and Transportation Critical Factors (TTCF). These 26 identified strategic TTCF, which plays an important role for the different traffic and transport related crucial problems of the transportation system of 53 IMPC, were encoded by using the three-value ordinal scale: 1 (for largest presence, affecting seriously), 0 (for absence, the lowest level), 0.5 (medium or normal range) and the values of Ground Truth (GT_i) for each IMPC were also mentioned. The Genetic Algorithm Module of Strategic Optimization Decision Priority Portal generated total 5 chromosomes and the crossover probability P_c was 0.4 and mutation probability P_m was 0.2.

After seven cross validation runs of simulation, the optimality reached in the Genetic Algorithm Module of the SODP-TDSS and then the output results were first sent in real-time to the Central Transportation Vision Navigator Board having central vision navigator black board problem solving architecture. The Central Transportation Vision Navigator Board of the SODP-TDSS displayed the 26 identified strategic TTCF for all 9 categorized TDPA, in a set of competing futuristic alternatives with their respective optimized weights W_{TTCF} . Figure 2 and 3 shows the 26 identified strategic Traffic and Transportation Critical Factors (TTCF) with their respective optimized weights W_{TTCF} for all the 9 categorized Transportation Decision Priority Areas (TDPA).

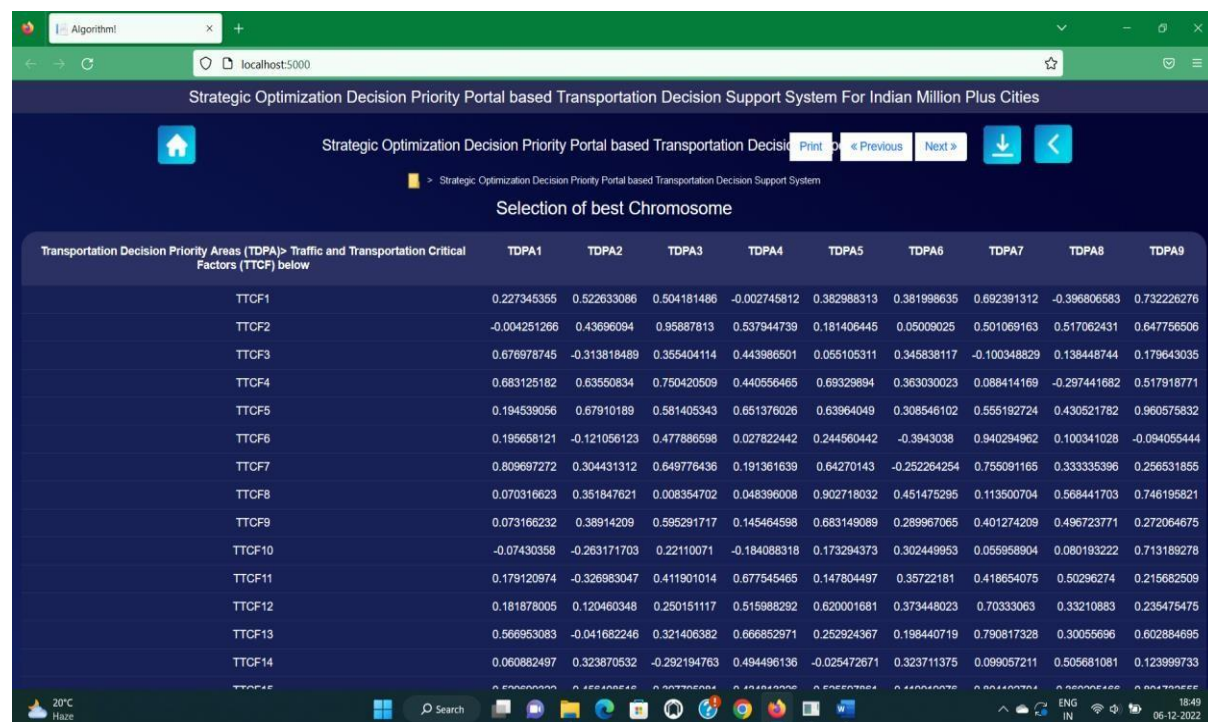


Figure 2: Strategic Traffic and Transportation Critical Factors (TTCF 1-14) with WTTCF

On the basis of optimized weights WTTCF of the 26 identified strategic TTCF shown in Figure 2 and 3 for all the 9 identified strategic Transportation Decision Priority Areas (TDP A), total 21 most prioritized strategic optimal TTCF were selected in the Central Transportation Vision Navigator Board and then were finally sent to Transportation Decision Making-User Desk for analysis, decision and action through Transportation Decision Exchange Server or Transportation Queries Support Server.

TTCF 3: Road Construction and TTCF 7: Metro Construction are very critical for the traffic and transport related crucial problems of the transportation system of the majority of IMPC and will optimize the Decision Target (DT): Transportation Decision Priority Areas: TDP A 1: Traffic Congestion. For the improvement and management of the current poor traffic and transportation system of the majority of the Indian Million Plus Cities (IMPC), Air and Noise pollution (TTCF 2), Carpooling (TTCF 4) and Emissions and GHGs (TTCF 16), are very critical and will strategically optimize the Decision Targets (DT): Transportation Decision Priority Areas: TDP A 3: Traffic Pollution.

TTCF 22: Fast Tag System, TTCF 19: Public Awareness Programs and Strategies, TTCF 21: Speed Limit are very critical for the traffic and transport related crucial problems of the transportation system of the majority of IMPC and will optimize the Decision Target (DT): Transportation Decision Priority Areas: TDP A 2: Toll Collection, TDP A 6: Public Awareness TDP A 8: Road Safety respectively. For the improvement and management of the current poor traffic and transportation system of the majority of the Indian Million Plus Cities (IMPC), Technology Deployment (TTCF 11) and Proper footpath (TTCF 23) are very critical and will strategically optimize the Decision Targets (DT): Transportation Decision Priority Areas: TDP A 4: Transportation System Infrastructure.

TTCF7	0.809697272	0.304431312	0.649776436	0.191361639	0.64270143	-0.252264254	0.755091165	0.333335396	0.256531855		
TTCF8	0.070318623	0.351847621	0.008354702	0.048396008	0.902718032	0.451475295	0.113500704	0.588441703	0.746195821		
TTCF9	0.073166232	0.38914209	0.586291717	0.145464598	0.683149089	0.289967065	0.401274209	0.496723771	0.272064675		
TTCF10	-0.07430358	-0.263171703	0.22110071	-0.184088318	0.173294373	0.302449953	0.059958904	0.080193222	0.713189278		
TTCF11	0.179120974	-0.326983047	0.411901014	0.677545465	0.147804487	0.35722181	0.418654075	0.50296274	0.215682509		
TTCF12	0.181878005	0.120460348	0.250151117	0.515988292	0.620001681	0.373448023	0.70333063	0.33210883	0.235475475		
TTCF13	0.566953083	-0.041682246	0.321406382	0.666852971	0.252924367	0.198440719	0.790817328	0.30055696	0.602884695		
TTCF14	0.060882497	0.323870532	-0.292194763	0.494496136	-0.025472671	0.323711375	0.099057211	0.505681081	0.123999733		
TTCF15	0.529699322	0.456408516	0.397795081	0.434813226	0.525597861	0.119019076	0.804102704	-0.360295166	0.801732555		
TTCF16	0.315992127	0.161334889	0.652780614	0.023372881	0.448442868	0.284662145	0.136763363	0.272932019	0.087629789		
TTCF17	0.606310077	0.359518512	0.14293317	-0.127437923	0.45256526	0.647596112	0.660153794	0.310170161	0.405109468		
TTCF18	0.092919067	-0.025390332	0.302089408	-0.031192121	0.073778348	-0.193604364	-0.007532282	0.224734482	0.291317389		
TTCF19	0.230342426	-0.019530788	-0.23038301	0.118568827	0.455130186	0.724739895	-0.128654511	0.056850124	0.092412782		
TTCF20	0.610824208	-0.327406953	-0.301428146	0.505306116	-0.507606551	0.247298831	0.727110996	0.797798974	0.810853857		
TTCF21	-0.106938259	0.423046972	0.045091574	0.027763197	0.07097369	0.11495041	0.479958422	0.879685061	0.402981453		
TTCF22	0.084567921	0.763580271	0.141509634	0.409405232	0.203573206	0.558192785	0.538380562	0.105284535	0.732584394		
TTCF23	0.459880216	0.043302866	-0.400341178	0.783913484	0.221139756	0.363881719	0.175935591	0.124178165	-0.008068332		
TTCF24	0.345330494	0.078972497	0.335126003	0.471520273	0.180563577	0.450443456	0.390275146	0.230325253	0.052577862		
TTCF25	-0.168522297	0.022574894	0.395470073	0.395053556	0.067555005	-0.016005738	0.372642644	0.25742424	-0.310690649		
TTCF26	-0.436223087	0.180366338	-0.170693885	-0.249918686	0.408042602	0.231735182	0.512816659	0.288780842	0.403078681		

Figure 3: Strategic Traffic and Transportation Critical Factors (TTCF 15-26) with W_{TTCF}

TTCF 1: Number of Accidents, TTCF 5: Violation of Traffic Rules and Regulations, TTCF 10: Traffic signals and TTCF 20: Separate Lane for Emergency Services are very critical for the traffic and transport related crucial problems of the transportation system of the majority of IMPC and will optimize the Decision Target (DT): Transportation Decision Priority Areas: TDPA 9: Traffic Management. For the improvement and management of the current poor traffic and transportation system of the majority of the Indian Million Plus Cities (IMPC), Multi-Modal Integration (TTCF 6), Connectivity and Convenience (TTCF 12), Commuters Satisfaction & Safety (TTCF 13), Public Transport Road Priority (TTCF 15) and Frequency of Bus (TTCF 17) are very critical and will strategically optimize the Decision Targets (DT): Transportation Decision Priority Areas: TDPA 7: Public Transport. TTCF 8: On-street parking and TTCF 9: Parking duration are very critical for the traffic and transport related crucial problems of the transportation system of the majority of IMPC and will optimize the Decision Target (DT): Transportation Decision Priority Areas: TDPA 5: Parking.

The above selected 21 most prioritized strategic optimal TTCF are bound to optimize the strategic Transportation Decision Priority Areas (TDPA) and will reduce and manage the different traffic and transport related crucial problems of the transportation system of Indian Million Plus Cities (IMPC). The generated results were evaluated to measure the performance of the developed SODP-TDSS and it was very encouraging that the range of specificity and sensitivity calculated for all the 9 Transportation Decision Priority Areas (TDPA) was between 93-98 % and 84-92% respectively and the mean accuracy of developed SODP-TDSS was 96%, which clearly matched with the opinion of the eminent Indian transportation experts and researchers. The Visual Studio 2019 Platform was used as a front-end application for the development of SODP-TDSS. The SQL Server 2019 was used as a back-end application for preparing the database. The Genetic Algorithm Module was developed with PHP programming language using Apache server.

4. Conclusion

In this paper, a Strategic Optimization Decision Priority Portal based Transportation Decision Support System (SODP-TDSS) is designed and developed using six main subsystems: Transportation Data Base Access and Management Sub-system, Transportation Model Base Management Sub-system, Strategic Optimization Decision

Priority Portal based Optimization Vision Technology Base, Central Transportation Vision Navigator Board, Dialog Management Sub-system, and Transportation Decision Making-User Desk, for the strategic optimization of transportation decision priority areas of Indian million plus cities by identifying and determining most prioritized strategic optimal traffic and transportation critical factors with their respective optimized weights WTTCF to reduce and manage the different traffic and transport related crucial problems of the transportation system of Indian million plus cities. The SODP-TDSS generated 21 most prioritized strategic optimal Traffic and Transportation Critical Factors (TTCF) for total 53 Indian Million Plus Cities with their respective optimized weights WTTCF for all 9 identified strategic Transportation Decision Priority Areas (TDPA). The range of specificity and sensitivity calculated for Transportation Decision Priority Areas (TDPA) was between 93-98 % and 84-92% respectively and the mean accuracy of developed SODP-TDSS was 96%.

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