TRDISF_Q A Seasonal Prediction Model Integrated In RDBMS Platform for Brihan Mumbai Electric Supply and Transport UNDERTKG (BEST) Mumbai

A. K P DEEPDARSHAN[1], B. KUSHNAPPA K[2], C. ARPITHA H K[3]
[1] *Assistant Professor, Wollega University, Ethiopia*
[2] *Assistant Professor, Mainefhi College Of Engineering And Technology, Eritrea*
[3] *Assistant Professor, Govt Engg College, Hassan, Karnataka*

Abstract- ***The urbanization in India causes rapid rise in urban population in cities gives rise of increasing in vehicle and vehicle users. In spite of the increase in the number of travellers, the urban bus transport organizations still operate under heavy losses. This is mainly due to non-availability of right information at the right moment on various aspects of operation and functioning of public transport systems. The present work deals with the development of a seasonal prediction module for BEST public transportation. In this the specific databases for bus transport management is first designed, then developing a module for data retrieval and displaying by seasonal variation.***

This seasonal prediction model integrated in RDBMS platform for BRIHAN MUMBAI ELECTRIC SUPPLY AND TRANSPORT UNDERTKG (BEST) Mumbai is effectively used by transportation engineers to take right decision at right time to manage the public transportation in high profit.

Indexed Terms- ***BEST, DSS, Entity relationship, TRDISF_Q, Regression analysis, SPSS***

I. INTRODUCTION

Public transport systems in the form of buses have played a major role in providing mobility to urban commuters in India over several decades. However, the non-availability of critical information at the right moment on various aspects of the functioning of bus transport undertakings severely reflects on their performance. The losses suffered in the operation of bus transport systems necessitate constant monitoring of activities in this sector. Efficient and well-managed bus transport systems can provide solutions to the above problems to a large extent. Information Systems developed with Decision Support Capabilities within the framework of an Advanced Relational Data Base Management System (RDBMS) can play a major role in planning important aspects, and monitoring the performance of Urban Bus Transport Organizations.

- DECISION SUPPORT SYSTEM FOR TRANSPORTATION PLANNING

DSS is defined as a specific class of computerized information system that supports business and organizational decision-making activities. A properly designed DSS is an interactive software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions.
Transportation planners are responsible for improving system performance, rationalizing upgrading and maintenance strategies based on often conflicting interests, and providing the public with increased transparency in the whole decision-making process.

- SPSS

Originally it is called as “Statistical Package for the Social Science” but now it stands for “Statistical Product and Service Solutions”. It provides a powerful statistical analysis and data management system in a graphical environment, using descriptive menus and simple dialog boxes to do most of the work for us. Most tasks can be accomplished simply by pointing and clicking the mouse.

One of the most popular statistical packages which can perform highly complex data manipulation and

analysis with simple instructions. SPSS is best used for minor data collection and especially data analysis.

- RDBMS

Data is one of the most important assets of a company. It is very important to make sure data is stored and maintained accurately and quickly. DBMS (Database Management System) is a system that is used to store and manage data.

A DBMS that is based on relational model is called as RDBMS. Relational model represents data in the form a table. A table is a two-dimensional array containing rows and columns. Each row contains data related to an entity such as a student. Each column contains the data related to a single attribute of the entity such as student name.

One of the reasons behind the success of relational model is its simplicity. It is easy to understand the data and easy to manipulate.

- OBJECTIVE OF THE WORK

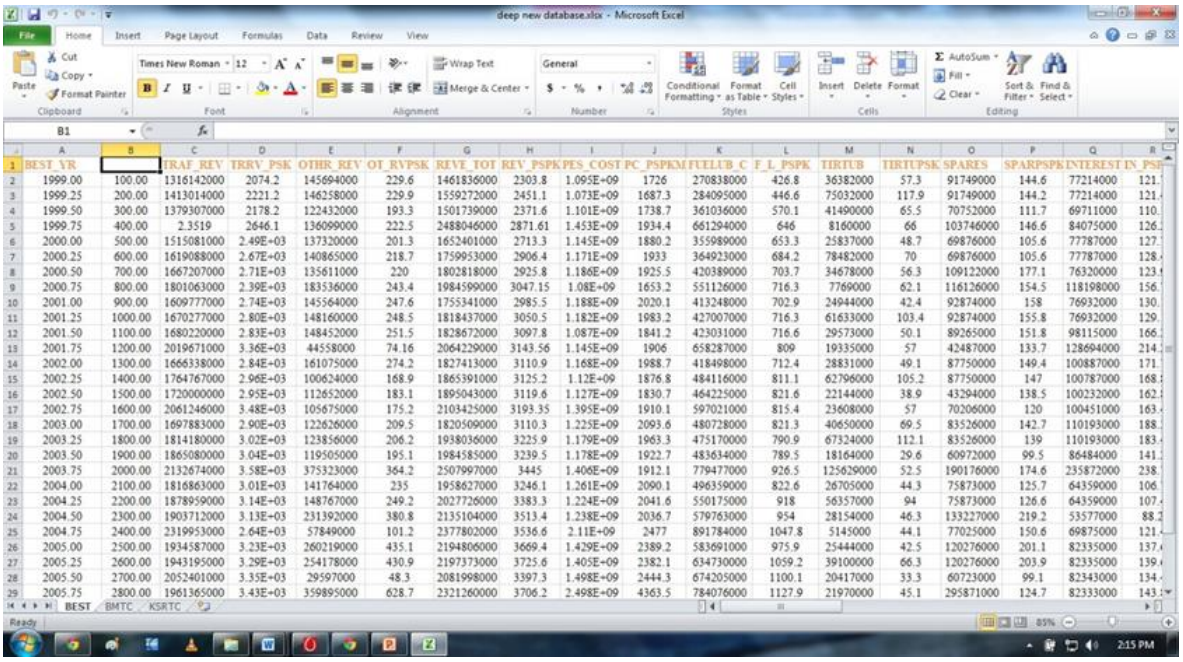
i. Collection of Quarterly data on financial and operational aspects of BEST for 5 years (2015-2019) which is published by *central institute of road transport*, Pune.
ii. Identification of important financial and operational parameters for the evaluation of efficiency and effectiveness of BEST undertaking of Mumbai.
iii. Selection and Identification of curves and important parameters respectively for seasonal prediction based on curve fitting techniques.
iv. Development of TRDISF_Q module.
v. Development of back end to store the data in MS-access.
vi. Development of Visual studio Forms and interfaces to VP Expert System.

II. RESEARCH METHODOLOGY

- Incorporation of Data to MS Excel
  The collected data from CIRT journals from the year 2015 – 2019 are incorporated to MS excel.
- Statistical Product and Service Solutions
  The data which are incorporated in excel sheets are verified and imported to SPSS software to perform regression analysis.
- Curve Fitting Technique: The best curve has been selected by analysing the R^2 value, F - test, T - test, and their Significance Level (less than 5%).
- Seasonal Index: Seasonal variation is measured in terms of an index called seasonal index. Since the present work is considering quarterly data, there are 4 separate indexes obtained per year.
- Development of relative database management system:
  The MS-access software is used to create the Database by using the data's which is incorporated in the Excel sheets. These data's can be retrieved by using visual basic forms.
- VP-Expert system: The developed database is connected with VP-Expert system for the purpose of forecasting the relevant data.

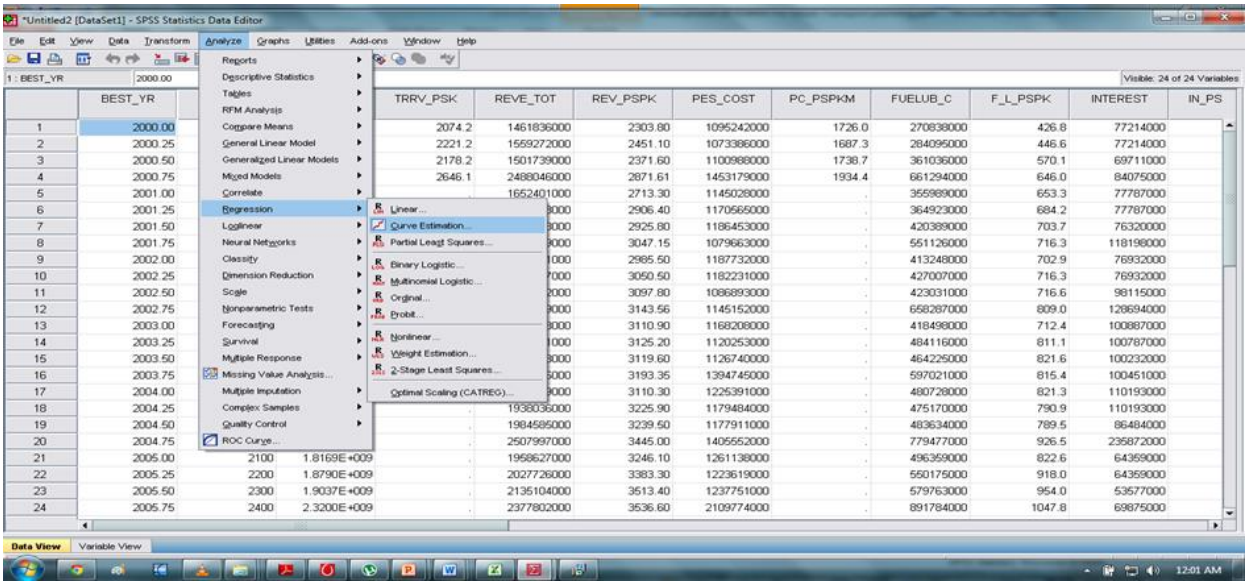
III. EXECUTION OF THE SEASONAL INDEXES PREDICTION

The financial and operational data of BEST state transport undertakings MUMBAI such as traffic revenue, revenue total, fuel lubricant cost, interest, personnel cost, depreciation, total cost, operational cost, motor vehicle cost, average number of bus held on road, average age, fuel consumption, number of accident fatalities, total accidents, passenger carried, spares, average number of buses held on road, passenger kilometre and so on. Such parameter has been entered in MS Excel where parameters are entered in rows and corresponding values are entered in columns.



- REGRESSION ANALYSIS OF DATA USING SPSS

Regression analysis is a statistical tool for the investigation of relationships between two or more variables. The curve fitting estimation is carried out using regression analysis, here dependent variable is considered as operational or financial parameter and independent variable is considered as time.



- Curve estimation results

Model Summary and Parameter Estimates

Dependent Variable: F_L_PSPK

Equation	Model Summary					Parameter Estimates			
	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	.900	235.168	1	26	.000	501.713	.203		
Logarithmic	.833	129.904	1	26	.000	-540.661	190.132		
Inverse	.525	28.757	1	26	.000	886.201	-64362.674		
Quadratic	.901	113.553	2	25	.000	510.185	.186	5.843E-006	
Cubic	.952	160.137	3	24	.000	381.517	.676	.000	9.542E-008
Compound	.860	160.035	1	26	.000	527.603	1.000		
Power	.905	246.265	1	26	.000	119.850	.266		
S	.663	51.231	1	26	.000	6.790	-97.021		
Growth	.860	160.035	1	26	.000	6.268	.000		
Exponential	.860	160.035	1	26	.000	527.603	.000		
Logistic	.860	160.035	1	26	.000	.002	1.000		

The independent variable is V2.

- HOW TO PERFORM SEASONAL PREDICTION:

Example: The selected curve is linear then the equation is y = b0 + b1.x

Where y stands for trend value,

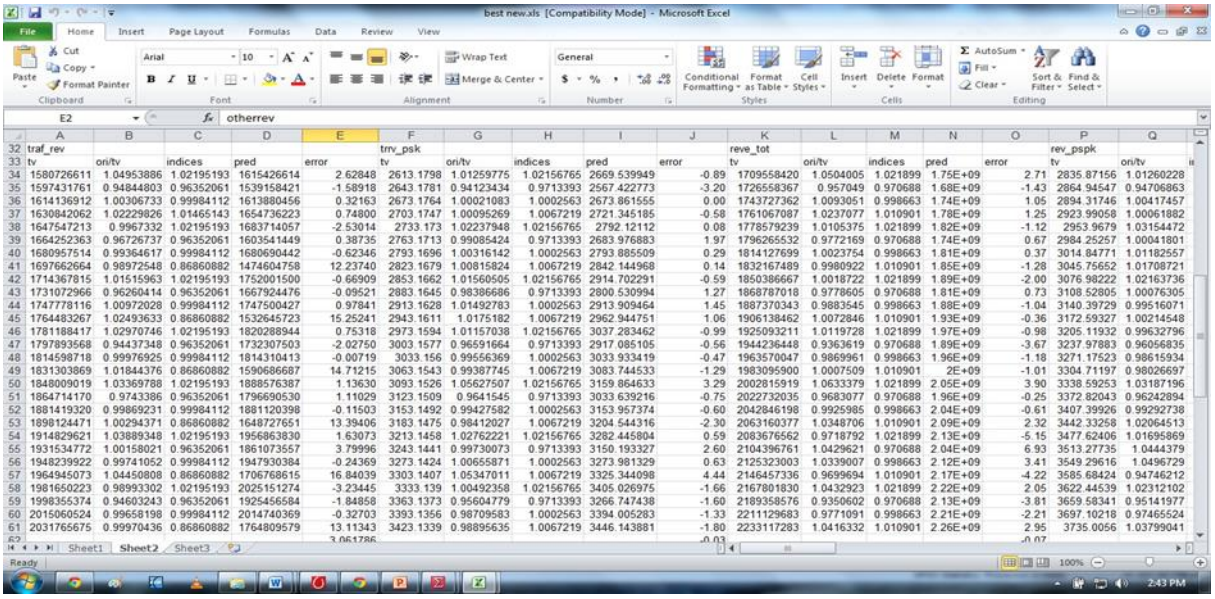
b0 and b1 values are obtained from the regression analysis results.

i. Predictions made using the best fitting curves to obtain the trend
ii. Actual value/ trend value = ratio to trend, was found
iii. Average ratio to trend for each quarter (for 7 years) was determined
iv. Seasonal indices were thus obtained

Hence,

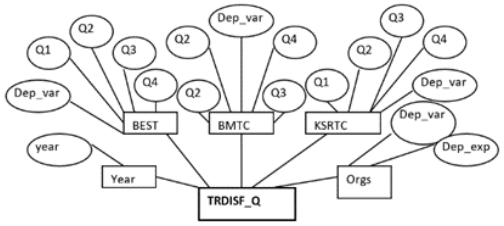
Seasonal prediction = predicted trend value x seasonal index

The obtained seasonal prediction for BEST undertakings is shown below:



IV. WORKING OF THE *TRDISF_Q* FORM

The transport manager is first required to login and activate TRDISF_Q. The form TRDISF_Q is then displayed. It is then required to select the transport undertaking for which the query has to be made, by clicking on the first combo box of the form. The combo box then links to the ORGS database that comprises the name of the BEST transport undertakings MUMBAI.

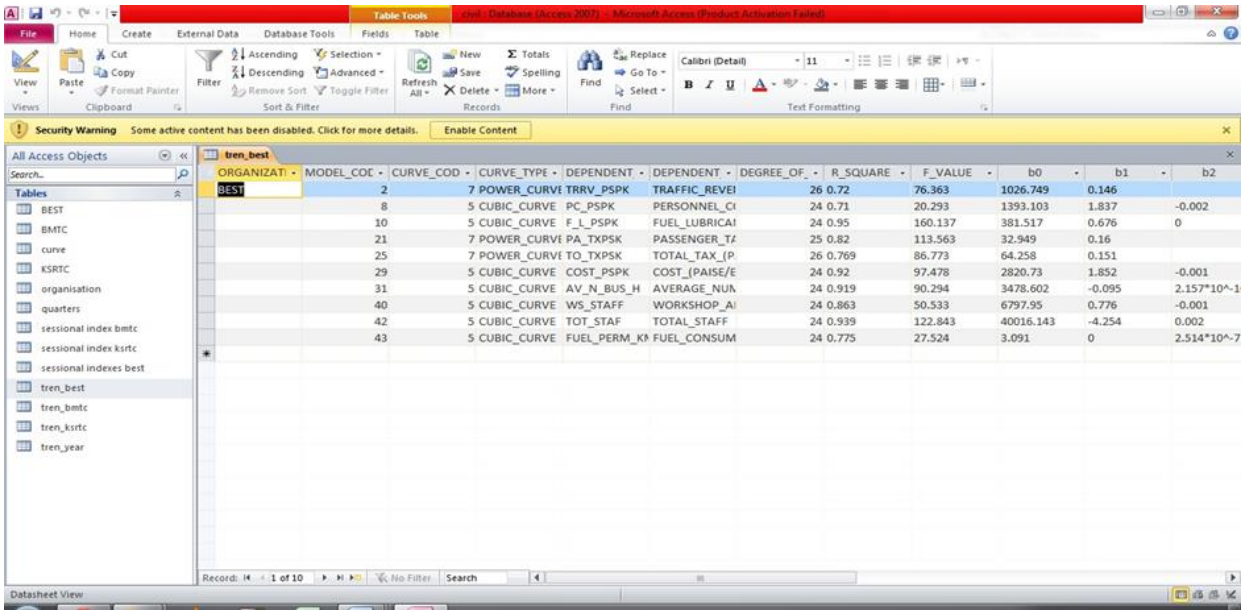


E.R diagram for *TRDISF_Q* form

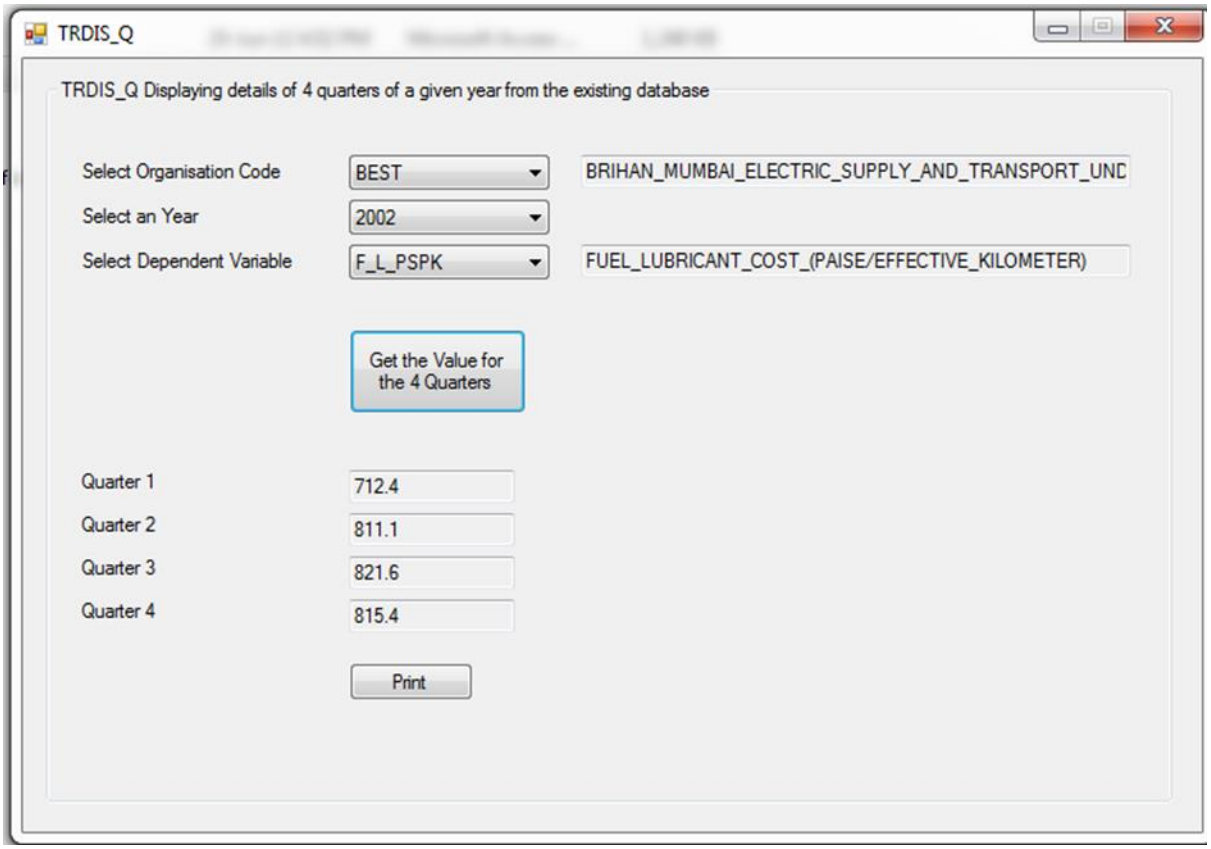
In the later part of the TRDISF_Q, the manager is required to specify the year for which the query has to be made by clicking on the combo box linked to the YEAR database that holds the list of years for which the data exists. The required component or variable for which the quarterly data is required to be displayed is then selected from the combo box linked to the DEPEND database which comprises the list of dependent variables and the explanations.

The transport manager is then presented with the available quarterly data for a selected year and variable. On pressing the ' PRINT ' button in the form, the TRDISF_Q stores all the relevant data regarding the selected variable into a formatted text file called TRDISF_Q.txt and prepares temporary ASCII output files for additional reference for the user.

The database for the seasonal prediction is developed using MS-Access which is described in the entity relationship diagram**.** Here number of tables is developed for all the selected state transport undertakings, such as BEST where details of the organization, dependent variable, curve, quarters, seasonal indexes, tren year. These details are entered in the MS-Access sheets in terms of rows and columns. The development of these kind of database in a table with two-dimensional array such as rows and columns called *relative database management system*. A table of database named as tren_best which belongs to BEST undertakings of Mumbai is shown below.



The frond end is designed by using visual studio and the front end form is shown below



TRDISF_Q for Query and Display of Quarterly data

V. RESULTS, DISCUSSIONS, AND CONCLUSIONS

The present study includes the use of entity-relationship diagrams in the development of a RDBMS based information system with DSS capabilities. The previous chapters deal with the development an important module used in a DSS for State Transport Undertakings that operate public transport buses. TREN module provides middle level managers with the capability to make seasonal predictions for various financial and operational parameters of the STUs. The relevant data was compiled and verified in MS Excel and exported to SPSS 20 statistical package.

The variation of each cost component with respect to the time scale was studied and the relationships were established through simple curve-fitting techniques. The ratio of the actual value for each quarter to the trend value was then obtained. The average value of the ratios for each season in the five year period provided the seasonal index that would assist in making seasonal predictions. The major results include the E-R diagrams, the process flow-charts, and the decision files. These provide important guide-lines for the development of the module. The important results of the software development activity include the finalized layouts of Visual Studio Forms for data manipulation and retrieval, interactive DSS module for decision making etc. This chapter presents the conclusions drawn from the 'software definition phase' and the 'software development phase' in the overall development of the DSS.

CONCLUSION

The overall development of the DSS involved the design of the data base structure for the information system, the development of basic data manipulation and retrieval forms, the design of basic expert system module for the DSS, and the interfaces between the

information system and the DSS module. The DSS module is developed which can forecast seasonal variations.

TRDIS_Q, is developed. TRDIS_Q was designed for query and display of quarterly values for the selected variables for a given year. This is an added advantage to the managers. ¬ The RDBMS for public transportation is developed using decision support system which enhances the decision capabilities of transportation managers in various aspects. The future planning about operational and functional criteria in public transportation can be effectively done by using this RDBMS, this kind of system will avoid the losses, minimizes the traffic problems, accelerates the decision capability etc

Percentages of errors are encountered while comparing variables actual values with the predicted values of BEST public transportation organization. Whenever R2 value is in the range of 0.8-1.0 and higher the F-test value, the error in prediction is less hence, it is concluded that to select the best curves which having more R2 and F-test values.

REFERENCES

[1] J.K.Sharma, Business Statistics published by Dorling Kindersley (India) Pvt. Ltd. Delhi 2006. Pp.590-600.

[2] Central Institute of Road Transport (CIRT) (1999-2005) Performance of State Road Transport Undertakings. *Journal of Transport Management*, PUNE.

[3] Chai Zengmeng, Jiang Haoxiang "*A Brief ReveiwOn Decision Support System And Its Application*"pp 401-405.

[4] Dr. Hany M. Ayad, Dr. Nadia S. El-Baghdady, Dr. Yousry A. Azzam, "*A Decision Support System For Land Use Activity Changes Using Data Gained from The Intelligent Transportation Systems",* pp. 1-2.

[5] Luminita Duta, Adrian Bituleanu, Florin Gheorghe Filip, Ion Istudor "*Computer-Based Decision Support For Railroad Transportation System: An Investment case Study*" journal of informatica economica, vol.13, no. 2/2009, pp.103-108.

[6] Man Chun Tan, Cong On Tong, Jian Min Xu "*Study And Implementation Of A Decision Support System For Urban Mass Transit Service Planning*" journal of information technology and management, volume xv, no. 1-2, 2004, pp. 14-19.

[7] Manjunath Kamath, Sandeep Sivathsan, Ricki G. Ingalls, " *TISCSoft: A Decision Support System for Transportation Infrastructure and Supply Chain System Planning"* Proceedings of 44th Hawan International Conference on System Sciences-2011,pp. 1-3.

[8] Marco Ghirardi, Luca Gobbato, Guido Perboli, *" AirCAST: a DSS for Business Decision in Air Transportation"* Interuniversity Research Center on Enterprise Networks, Logistics and Transportation, pp.1-2.

[9] Mehdi Sadeghzadeh, Mohammad Rostami, Mahdiyeh Afshari and Narges Chobdaran, "*Designing Expert System to Diagnose and Suggest about Esophagus Cancer Treatment Method",* 2nd International Conference on Management and Artificial Intelligence IPEDR Vol.35 (2012), Singapore, pp. 40-41.

[10] Mohamad K. Hasan, "A Framework for Intelligent Decision Support System for Traffic Congestion Management System", Published Online April 2010 (http://www. SciRP.org/journal/eng), pp. 41-42.

[11] Mohammed Taleb Obaidat, Hashem Al-Masaeid, Olfat Al-Haji, and Abdalla Qudah," A Knowledge-based System for Pedestrian's Roadway Crossing Behavior through Video Cameras", Jordan Journal of Civil Engineering, Volume 1, No. 2, 2007, pp. 123-124.

[12] WEBOGRAPHY:

http://censusindia.gov.in/, visited on January 21st.

http://www.egyankosh.ac.in/bitstream/123456789/35367/1/Unit-4.pdf, visited on 22nd august 2019.

http://www.gdcbemina.com/Study-Material/BCOM-FINAL-YEAR-STUDY-MATERIAL (COMPUTER)/B.Com.3rd-Study-material-Computer-Applications.pdf, visited on july 22nd.

http://media.wiley.com/product_data/excerpt/18/04712933/0471293318.pdf, visited on august, 22nd 2019.

http://public.dhe.ibm.com/software/analytics/spss/documentation/statistics/20.0/en/client/Manuals/IBM_SPSS_Statistics_Core_System_Users_Guide.pdf, visited on March 22nd.