CHAPTER – I

INTRODUCTION

Transport and Communications are the most important requirements for overall development of a region for trade, commerce and industry. Development in these fields facilitates momentum to social interaction, educational development and to improve the overall perception of the human being. Of all means of transport, road transport is one of the most basic necessities to the community. Inspite of the development of a variety of other modes of public transport, the dependence of the commuting public on the road based system continues to be considerable everywhere. The inherent flexibility of bus operation enables it to reach the remotest areas and bus services can be availed to meet practically every type of requirement.

Efficient and affordable transport system is a pre requisite for economic growth. The developed as well as developing countries are facing more or less the same challenges when it comes to transportation.

All over the world road transport is the pillar which guarantees a reliable and a dependable service of carrying people and also goods from one place to another. Recognizing the importance of passenger road transport as a prime public utility service and a basic infrastructure for economic and social development, the Government of India immediately after independence passed a legislation for the formation of Road Transport Corporation (R.T.C) in 1950.
The Act is aimed at the formation of State level public sector road transport corporation to provide an adequate, efficient, economic and a well co-ordinated road transport services to the traveling Public. Though the automobile vehicle appeared on Indian roads in 1898, roads and road transport saw its real boost after 1950.²

The National Transport Policy Committee was appointed by the Government of India in April 1978 for the purpose of suggesting a comprehensive National Transport Policy. The committee completed its’ work and submitted its’ report to the Government in May, 1980.³

The Road Transport Corporation Act of 1950 has been the major inspiration for public sector bus transport in the country. The last four decades have seen phenomenal growth in the size of some of the major R.T.Cs. The Andhra Pradesh Road Transport Corporation, The Maharastra State Road Transport Corporation and the Gujarat State Road Transport Corporation have a monopoly of operating bus services in their respective states.⁴

The merit of bus transport, over other modes of public transport, lies in its flexibilities, easy penetration into inaccessible areas, and personalized and impromptu service.⁵

A transport system can be developed optimally only when the transport and land use planning are examined together and bus services have to meet practically every type of requirement.⁶
Transport is an indispensable component of economic and social development. Given India’s vast area (3-28 million square kilometers) and demography (70% of population of 844 million lives in 6,00,000 villages), road transport has a leading role to play in providing passenger transport services.\textsuperscript{7}

Urbanisation, in the world as a whole, is outstripping the population growth. India is experiencing both massive and rapid urbanization.\textsuperscript{8}

India is a vast country with a population of 844 million in 1991 and the trend of urbanization in the country has been steadily rising especially during the last three decades\textsuperscript{9}. Information on population for the periods 2001 and 2011 have been obtained through website (http://www.censusindia.gov.in). It is recorded that the total population of 2001 in India is 1028 million (Rural 742 + Urban 286) and it rose to 1210 million (Rural 833 + Urban 377) in 2011. In Andhra Pradesh the total population registered in 2001 is 7.62 crores (Rural 5.54 + Urban 2.08) and is increased to 8.46 crores (Rural 5.63 + Urban 2.83) in 2011. Coming to Visakhapatnam District the total population on record in 2001 is 38 lakhs (Rural 23 + Urban 15) and it shot up to 42 lakhs in 2011 (Rural 22 + Urban 20) in 2011. This significant increasing travel in population size and also migration of people from rural to urban areas necessitates well planning of the public transport system particularly urban transport system. Urban areas are attracting centres for rural population because of the opportunities for employment, improved standard of living, better facilities and a colourful life. The cities efficiency largely depends upon the effectiveness of its transport system.
Andhra Pradesh Road Transport Corporation (APSRTC) is an important public transport sector in the state of Andhra Pradesh and is a part of the community. It is intended to serve the community by providing an efficient, adequate, economical and properly Co-ordinated system of road transport services in the state.

When it comes to the question of serving a community, the community at large can be separated into various small communities based on the clientele. For example APSRTC serves the business community, the student community, government employees, long distance traveling employees, the urban and rural people etc. Consequently, these different groups have different criteria for measuring the effectiveness of the public transport service available to them. Convenience is the key word for passengers and is measured in terms of waiting time, travel time, travel comfort, availability of seat and effortless stepping in and stepping out from the bus. It is essential for bus transport operators and the concerned authorities to consider these factors in order to make the public transport viable and attractive in the cities.
1.1 Importance of Urban Transportation

Urban transportation has become the basic ingredient for providing the much needed mobility to men and material and also for the growth of the urban economy.\textsuperscript{10}

Urban transport in India has been dominated by the buses and a demand driven approach is far better where an efficient public transport system weans away the demand for the personalized vehicles.\textsuperscript{11}

Buses are the major mode of transport in big cities and the dependence on this mass transit system may be as high as 60 to 70 percent in terms of passengers served.\textsuperscript{12}

Mass transit is sometimes called common carrier service provided for the carriage of passengers and limited luggage on fixed routes and schedules at predetermined fares. The dependence on urban transportation is increasing and any improvement in urban transport system would increase the urban mobility and travel comfort greatly. Transportation facilitates mobility of, and accessibility to, men and materials.\textsuperscript{13}

While cities and towns are growing rapidly and are doubling in their population size in a period of about two decades, the travel demand within them is increasing at geometric proportions, by four to eight times.\textsuperscript{14}
Urban transport directly influences the welfare of city dwellers. Road transport is the major mode of transport for the people of Visakhapatnam in Andhra Pradesh, and among different modes of transport, bus transport occupies an important place. It is now established beyond doubt that urban transport plays an extremely important role in the quality of life of urban dwellers.\textsuperscript{15}

1.2 Significance of the Study

The importance of urban transport in enabling urban growth and ensuring its well being is being appreciated. In an urban area activities get distributed over space. It is the urban transport that enables their interaction, interlinkages and integration. If the urban areas are considered as engines of growth and generators of economic momentum, their transport system is both, the wheel and the lubricant of such an engine. Urbanisation in the world as a whole is outstripping the population growth. India is experiencing both massive and rapid urbanization. The National Council on urbanization was emphatic in stating that urban transportation is the most important single component instrumental in shaping urban development and urban living.\textsuperscript{16}

The fast growing Visakhapatnam city, in Andhra Pradesh, India, is abound with industrial development. In view of the educational institutions it has, and also various other state, central, Public Sector and private establishments, there is increasing need for speedy and Convenient road Conveyance system for carrying various categories of people to reach their destinations well on time. People living in remote rural areas and also agency areas namely, Paderu, Araku
and Chintapally daily commute to the city by public transport system on different purposes. People from other distant places also visit the city for different purposes and depend on the public transport system. It is in this context the present study is undertaken to have a basic understanding of the city public Transport System of Visakhapatnam region covering urban operations on selected parameters.

1.3 Need for the Study

Visakhapatnam, the coastal city of Andhra Pradesh, India, is popularly known as the City of Destiny and also the Steel City. Visakhapatnam district is distinct from other districts in the state in that it has tribal villages in remote agency areas like Paderu, Chintapalli and Araku, in addition to many of its adjoining agriculture based villages. All the villages are connected to the city with improved road-ways. People living in these areas belong to different economic strata with different occupations and activities and need a convenient public transport system for their mobility when they come to the city.

Apart from a number of educational institutions, there are also number of state and central Government establishments located in the city. There is time to time expansion taking place in big public sector undertaking in the city viz., Visakhapatnam Port Trust of India, Naval Dock yard, Eastern Naval Command, Dredging Corporation of India, Visakhapatnam Steel Plant, National Thermal Power Corporation, Hindustan Petroleum Corporation of India, Hindustan Polymeres, Zinc Smelter Plant and Bharat Heavy Plants & Vessels. Employees
working in these different establishments, other companies and also people coming to the city from other places on different works depend mostly on urban transport of APSRTC. People also prefer city services of APSRTC to avoid the risk of driving in congested traffic places and also driving long distances on personal vehicle. They look forward for a convenient and comfortable public transport system in the city. The urban transportation of APSRTC Visakhapatnam region is expected to work with efficiency in meeting the demands of various categories of people of Visakhapatnam. There are no studies available on the urban transport of APSRTC - Visakhapatnam Region. It is in this contest an attempt is made to study on the Urban Transportation of APSRTC – Visakhapatnam Region to have an understanding on some important aspects relating to personnel management and performance evaluation indicators.

Performance evaluation is an important means of promoting the operational efficiency in public transport system (Feilding et. al 1985; Gomes 1989). The corporations definitely should have a control over the operational efficiencies which will reduce their per-unit operational cost and also render service to the satisfaction of commuters. The corporations should strive to improve efficiency parameters such as fleet utilisation, vehicle utilisation, bus staff ratio, kilometer per liter of diesel, accidents and break downs etc. to reduce the cost per effective kilometer. Operational efficiency is one of the keys to successful performance of an organisation. It is in this context that some of the important performance indicators of urban transportation of APSRTC
Visakhapatnam city services are examined since the formation of A.P.S.R.T.C Visakhapatnam Region in 1994 as there are no studies available on this aspect.

1.4 Statement of the Problem

The need for the transport corporation arises out of the fundamental duty of the state to work for the welfare of the public. State Road Transport has come to be regarded as an important vehicle to achieve socio economic objectives. With this in view Andhra Pradesh State Road Transport Corporation (APSRTC) was established with effect from 11\textsuperscript{th} January 1958 as per G.O. M.S. No. 38. Home (Transport) Department dated 6\textsuperscript{th} January, 1958.

“APSRTC Visakhapatnam region has committed to provide consistently high quality of services and to continuously improve the services through a process of teamwork for the utmost satisfaction of the passengers and to attain a position of pre-eminence in the Bus Transport sector.” (Vision of A.P.S.R.T.C. website www.andhrapradesh.com/apsrtc).

A.P.S.R.T.C took up nationalization of bus routes in Visakhapatnam on December 12, 1978 as per the office records of the Regional Manager, APSRTC, Visakhapatnam. This service sector is the network which connects the cities, towns and villages in the state and also out of the state. In Visakhapatnam city there are five city Bus Depots, which have administration to plan and oversee the operations.
Thus, the quality of services in passenger road transport undertaken by the APSRTC Visakhapatnam City assumes primary importance as it has direct relationship with the commuters’ satisfaction. The quality of services rendered by the Corporation vis-a-vis the commuters’ satisfaction depend on various aspects like passenger amenities, adequacy of trips, safety, regularity of trips, reliability and punctuality of services.

Today the performance record of the APSRTC in providing satisfactory services to the commuters has been subjected to severe public scrutiny and criticism. There is a hue and cry against the corporation that it has virtually failed in providing satisfactory services to the commuters. Sometimes, it is also observed that the APSRTC is unsuccessful in providing even the minimum commuters’ satisfaction.

Therefore, in view of the above sweeping remarks, it became necessary for the researcher to test their credibility and establish the truth. Hence, the study entitled – ‘Performance Appraisal of Urban Transport of Visakhapatnam – A Study is taken up, and tested the hypothesis from two angles viz., (1) from the angle of the Corporation and (2) from the angle of the commuters, for making suitable suggestions for a better performance and for a higher commuters’ satisfaction.
1.5 Objectives of the Study

1. To present briefly the history of Andhra Pradesh Road Transport Corporation and the introduction of APSRTC services in Visakhapatnam.

2. To study the personnel management on aspects relating to organizational structure, recruitment, training and other service matters of the personnel working in APSRTC Visakhapatnam Region.

3. Performance analysis of urban depots of APSRTC Visakhapatnam region, since its formation in 1994, on selected financial and non-financial indicators as dictated by the available data from the office records for improvement wherever necessary.

4. To suggest measures to be taken up to the authorities concerned for the improvement of APSRTC urban transport of Visakhapatnam, basing on the studies undertaken and the suggestions obtained from the commuters through questionnaire / personal interview.

Period of the Study (1993-94 to 2009-10)

Prior to 1965, the depots in APSRTC were managed by supervisory rank persons. In October 1965 Depot Managers are posted as officers to each depot and they would function as incharge of depots, looking after all functions relating to stores, personnel, mechanical, engineering, operations and security. In view of the considerable growth in the size of the organization between 1965 and 1977 in terms of Fleet, Staff, Depots and Divisions for better administration. Regional set up was introduced in APSRTC with decentralization of powers with effect from
January 1968. As a consequence of this APSRTC Visakhapatnam Region was formed in November 1994.

There are no studies available on the functioning of APSRTC Visakhapatnam Region since its formation in 1994. Hence to have an understanding of the performance of Visakhapatnam Region since its commencement of operations in 1994, till 2010, studies are conducted from 1993-94 to 2009-10 on selected efficiency parameters such as bus Earning Per Bus (E.P.B), Kilometres Operated (volume), Average Vehicle Utilisation, Occupancy Ratio (O.R), Bus Staff Ratio (B.S.R), Crew Utilisation, Employees’ Productivity (E.P), H.S.D Oil KMPL and reduce Bus Staff Ratio (B.S.R) which are financial indicators and also on the incidence of non-financial indicators, namely, cancellations, breakdowns and accidents during the period 1993-94 to 2009-10 years.

1.6 Hypothesis

1. There is no significant difference in the performance of APSRTC in financial indicators like Earning Per Bus, Kilometres Operated, Average Vehicle Utilisation, Occupancy Ratio, Bus Staff Ratio, Crew Utilisation, Employees’ Productivity, H.S.D Oil KMPL and reduce Bus Staff Ratio and incidence of non-financial indicators like cancellations, breakdowns and accidents of buses during the period 1993-94 to 2009-10 years.

2. There is no significant difference among different categories of people namely students, employees, businessmen, and general public, in their
opinion towards the services provided by the APSRTC Visakhapatnam region in urban area.

1.7 Research Design

“A research design is the arrangement of conditions for the collection and analysis of data in a manner that aims to combine relevance to the research purpose with economy in procedure.” – Claire Selltiz 1962.

“Research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance.” – Kerlinger 1960.

The definition of Kerlinger includes three important terms – plan, structure and strategy. The plan is the outline of the research scheme on which the researcher is to work. The structure of the research work is a more specific scheme and the strategy suggests how the research will be carried out i.e. methods to be used for the collection and analysis of data.

In brief, research design is a framework or blueprint for conducting the research project. It details the procedures necessary for obtaining the information needed to structure and/or solve the research problem. It is the specification of methods and procedures for acquiring the information needed for solving the problem. Questionnaires, forms and samples for investigation are decided while framing research design. Finally, the research design enables the researcher to arrive at certain meaningful conclusions at the end of proposed study.
A research design is like a roadmap. Depending on the research purpose and objectives, the research designs are categorized as exploratory or formulative, descriptive or diagnostic and hypothesis testing research studies.

1.8 Research Methodology

The main purpose of exploratory of this research is to analyse the performance evaluation of APSRTC in Visakhapatnam region during the period from 1993-94 to 2009-10 and to define the problem more precisely, identify the relevant source of action i.e. quality indicators of the organization and find the most likely alternatives, which are then turned into hypotheses, isolate key variables and relationships for further examination, gain insights for implementing an approach to a problem and finally establish priorities for further research.

1.9 Selection of Organization for the Study

People living in Visakhapatnam city belong to different economic strata with different occupations and activities and need a convenient public transport system when they come to the city. There are a number of educational institutions and also State and Central Government establishments located in Visakhapatnam city. There are also big public sector undertakings in the city Viz. Port Trust of India, Naval Dockyard, Eastern Naval Command, Dredging Corporation of India, Visakhapatnam Steel Plant, National Thermal Power Corporation, Hindustan Petroleum Corporation of India, Hindustan Polymers, Zinc Smelter Plant and Bharat Heavy Plants & Vessels.
Students, number of employees working in these different establishments, other companies and also people coming to the city on different works have to depend for transportation on their own vehicles, namely, two wheelers or four wheelers or depend on Auto rickshaws, tempos, cabs, or public transport to reach their destinations. Here people mostly depend on urban transport of APSRTC. People also prefer city services of APSRTC to avoid the risk of driving in congested traffic places and also driving long distances on personal vehicles. They look forward for a convenient and comfortable public transport system in the city. The urban transportation of APSRTC Visakhapatnam Region is expected to work with efficiency in meeting the demands of various categories of people of Visakhapatnam. It is in this context that Urban Transport of APSRTC-Visakhapatnam Region is selected for the present study.

The main objective of the study is to evaluate performance of urban transportation of APSRTC Visakhapatnam region and its impact on the organization and also the service levels provided to the urban people in the study area. Keeping the above factors under consideration, five APSRTC depots in the city limits of Visakhapatnam have been selected for the present study.

The selected study units are known in their transport activities and the major role played in the transportation of passengers in fast growing city in the state and has witnessed several upheavals and dynamics which have brought it to the position in which it specialized at present. The need for the optimum utilization of transport services in the city to face the challenges emerging from its
fast growing population environment in the present and expected developments in the future forces to look at urban criteria from short and long-term perspectives. At this juncture, it is necessary to determine the levels of performance in APSRTC Visakhapatnam urban area in the context of transport sector of passengers oriented, and come up with suitable, workable and acceptable recommendations which help an organization and its management to raise their performance and excel in the current situations as well as be prepared to tackle any scenario thrown at them in the future too.

1.10 Method of Investigation

The study is mainly based on the secondary data of performance indicators of APSRTC urban depots of Visakhapatnam. In this regard the investigator has collected the information about performance indicators like bus schedules, fleet held, earnings per kilometers, earnings per bus, volume (productivity), average vehicle utilization, occupancy ratio, percentage of cancellation, breakdown ratio, accidents etc, during the period from 1993-94 year to 2009-10 year. This total period taken up for study is long and hence is divided into two periods that is from 1993-94 to 1999-2000 as one period and 2000-01 to 2009-10 as second period for convenience and comparison of study of parameters and their growth rates. Along with the secondary data the investigator also designed a questionnaire to collect the information from passengers about the performance of services provided by the APSRTC in the selected study area. This method of investigation is an important one and there will be no confusion with the more clerical routine of gathering and tabulating
figures. It involves a clearly defined problem and definite objectives. It requires expert and imaginative planning, careful analysis and interpretation of the data gathered, logical and skillful reporting of the findings. For this the researcher has collected the required data and information from the sample city bus depots and respondents of study area through study tool.

1.11 Tools of the Study

Tool is one of the important elements in the study through which the researcher will derive necessary information relating to the investigation. The questionnaire is one of the tools for the present investigation to collect primary data from the respondents who are regularly travelling in city buses in the study area. In this study, interview with passengers of the selected area is one of the sources for obtaining most reliable data from the respondents. The required information can be obtained through pre-designed questionnaires. This type of investigation has proved to be a reliable and standard method for collecting data in the field of research.

The very purpose of this research is to evaluate the performance of Urban Transport of APSRTC Visakhapatnam urban through secondary data (records and database) and to know the opinions of the passengers of APSRTC city service on the performance of service levels provided to its commuters who are travelling from place to place and centre to centre in the city limits. The study obtained answers to the questions in the questionnaire given to the respondents (commuters on their willful acceptance and according to their free and frank
expression of opinion with no compulsion what so ever in this process. This will
determine the factors contributing positively or negatively for assessing the
performance of APSRTC in the city limits of Visakhapatnam.

The researcher has collected the information about the performance
indicators of APSRTC Visakhapatnam city during 1993-94 to 2009-10 years. The
total period of the study is divided into two parts as the total period is very long,
that is, from 1993-94 to 1999-2000 as one part and 2000-01 to 2009-10 as
second part for comparison. The trends of growth rates were tested in these two
periods and were compared with each other. In the second part of the
investigation a questionnaire is designed for the commuter based objective
model statements. The opinion of the sample respondents against each
statement is given by objective type answers. These objective type answers are
like Good, Satisfactory, To be improved, Standee etc., the scoring procedure for
the opinions are graded with three and four point scale. The respondents are
requested to give opinion by putting a tick (√) mark on any one of the
alternatives. The investigator has collected the necessary information from city
bus passengers with the help of this questionnaire.

The analysis of data has been divided into two sections, the first section
deals with performance evaluation on the indicators of APSRTC city depots
during period from 1993-94 to 2009-10 years and the second section deals with
performance of service levels measured through opinions of the commuters in
the study area. In addition to the statements relating to the performance of
APSRTC, the questionnaire is also asking personal information of the commuters like occupation, place of working etc.

Before the questionnaire was administered, the researcher has conducted a pilot study in order to test the validity and appropriateness of the statements. Item validity of commuters' questionnaire is determined by critical ratio values, comparing the upper 27% and lower 27% groups.

### 1.12 Finalization of the Questionnaire

The investigator has personally involved in the study by visiting different sections and departments of the selected APSRTC city depots and collected the necessary data as a part of pre–testing of the questionnaire. The required data was subjected to statistical treatment by using Critical Ratio Method for establishing the validity and reliability of the instrument. After analyzing the data with this method all the statements having 0.01 and 0.05 levels of significance are taken for examination.

**Table – 1.1: Item validity of commuters – Critical ratio values, comparing the upper 27% and lower 27% groups**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Statistics</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower</td>
<td>Mean</td>
<td>1.33</td>
<td>1.67</td>
<td>2.00</td>
<td>1.50</td>
<td>1.33</td>
<td>1.67</td>
<td>1.50</td>
<td>1.33</td>
<td>1.17</td>
<td>1.50</td>
</tr>
<tr>
<td></td>
<td>St.Dev.</td>
<td>0.52</td>
<td>0.52</td>
<td>1.26</td>
<td>0.55</td>
<td>0.52</td>
<td>0.82</td>
<td>0.55</td>
<td>0.52</td>
<td>0.41</td>
<td>0.55</td>
</tr>
<tr>
<td>Upper</td>
<td>Mean</td>
<td>3.33</td>
<td>3.67</td>
<td>4.00</td>
<td>3.50</td>
<td>3.50</td>
<td>3.83</td>
<td>3.17</td>
<td>3.33</td>
<td>2.33</td>
<td>3.00</td>
</tr>
<tr>
<td></td>
<td>St.Dev.</td>
<td>2.07</td>
<td>1.63</td>
<td>1.67</td>
<td>1.76</td>
<td>1.76</td>
<td>1.60</td>
<td>1.72</td>
<td>2.07</td>
<td>1.03</td>
<td>1.55</td>
</tr>
<tr>
<td>Critical</td>
<td>Ratio</td>
<td>2.10*</td>
<td>2.61**</td>
<td>2.13*</td>
<td>2.43*</td>
<td>2.64**</td>
<td>2.69**</td>
<td>2.06*</td>
<td>2.10*</td>
<td>2.35*</td>
<td>2.04*</td>
</tr>
</tbody>
</table>

** Significant at 0.01 level; * Significant at 0.05 level.
After eliminating the rejected statements at level of significance, the final questionnaire with ten statements was approved for administration. This Pre-test helped the investigator to structure the questionnaire and to improve the effectiveness and standardization of the final questionnaire.

1.13 Item Validity of the commuters’ Tools, Critical Ratio Values Comparing the Upper 27% and Lower 27% Groups

The questionnaire is containing ten statements where, three are significant at 0.01 level and the remaining seven are significant at 0.05 level. An overall picture for all these items of Critical Ratio values suggest that they are significant indicating item validity.

In the commuters’ opinion the description of questionnaire (10 statements) for all critical ratio values are found to be significant indicating item validity of each statement of the total test dealing with reference to performance of APSRTC in Visakhapatnam urban area and its impact on the service levels of the organization.

Not significant: None of the statements in the questionnaire are with not significant note.

0.05 level : Among the 10 statements, as many as 7 statements are significant at 0.05 level indicating the item validity of the total test.

0.01 level : The remaining 3 statements are significant at 0.01 level.
1.14 Administration of the Questionnaire

After preparing the questionnaire and subjecting it for investigation, the final questionnaire was accepted and administered for data collection. Since the mailed questionnaire will bring unsatisfactory results, the researcher had personally surveyed the selected five areas of city depots and administered the questionnaire with a sample of 100 commuters. The random sampling method was adopted for data collection and according to that the investigator has identified the city bus passengers from all the selected five areas in the study area. Among these passengers all categories of commuters were covered with different education levels and occupations. The particulars of the commuters about their occupation, place of working etc., are presented in the data analysis chapter.

1.15 Data Collection

a) Primary Data

The primary data is the information collected with the help of pre-designed questionnaire from the city bus passengers of the selected five APSRTC depot areas. The researcher has collected the necessary information from the Depot Managers regarding the buses and their service routs and timings of travel etc., for the convenient process of investigation. On the basis of the schedule timings, the researcher traveled in those buses and met with the commuters and explained about the study and how to fill the pre-designed questionnaire. In this
way the investigator has collected data from 100 city bus passengers which is used as primary data in this study.

**b) Secondary Data**

In order to acquire the secondary data, the researcher has visited Manuals Section, Department of Human Resource Development, APSRTC, Musheerabad, Hyderabad, offices of various selected departments of the organization (APSRTC), and had gone through their records and annual reports. The investigator has collected number of books and articles connected with APSRTC and transport sector, and gone through them to obtain more information on the administration of the selected organization in the state as well as in districts. The researcher also visited the Central Library at Andhra University and departmental library at Politics and Public Administration and also Central Library at Osmania University for collection of additional data from the books, journals, articles etc., and websites and other online content was also analyzed.

**1.16 Operational terms**

Operational terms, definitions and calculations are taken from ‘Management Information Systems in APSRTC’, Published by Manuals Section, Department of Human Resource Development, APSRTC, Musheerabad, Hyderabad.
1.16.1 Statistical Techniques for Analysis of Data

The study concerned with the performance evaluation of APSRTC in Visakhapatnam city depots on specified indicators are measured with the help of following statistical tools applied to the secondary data of the study area. The following techniques are used to analyze the performance of APSRTC in the study area.

Exponential Growth

Exponential growth (including exponential decay when the growth rate is negative) occurs when the growth rate of the value of a mathematical function is proportional to the function's current value. In the case of a discrete domain of definition with equal intervals it is also called geometric growth or geometric decay (the function values form a geometric progression). The exponential growth model is also known as the Malthusian growth model.

The formula for exponential growth of a variable $x$ at the (positive or negative) growth rate $r$, as time $t$ goes on in discrete intervals (that is, at integer times 0, 1, 2, 3, ...), is

$$x_t = x_0 (1 + r)^t$$

where $x_0$ is the value of $x$ at time 0. For example, with a growth rate of $r = 5\% = 0.05$, going from any integer value of time to the next integer causes $x$ at the
second time to be 1.05 times (i.e., 5% larger than) what it was at the previous time.

A quantity $x$ depends exponentially on time $t$ if

$$x(t) = a \cdot b^{t/\tau}$$

where the constant $a$ is the initial value of $x$,

$$x(0) = a,$$

and the constant $b$ is a positive growth factor, and $\tau$ is the time required for $x$ to increase by a factor of $b$:

$$x(t + \tau) = x(t) \cdot b.$$

If $\tau > 0$ and $b > 1$, then $x$ has exponential growth. If $\tau < 0$ and $b > 1$, or $\tau > 0$ and $0 < b < 1$, then $x$ has exponential decay.

1.17 Limitation of the Study

The main intention of the present investigation is to evaluate the performance of Urban Transport in Visakhapatnam and analyse the opinions of commuters on the service oriented performance of the study sector in transporting the city passengers. And it was also to find out the difference between two periods of study in performance indicators of the respective depots. Even though the investigator has considered the occupation, place of working etc., but other demographic variables not taken in the study. The study is limited to 100 samples, which is very small sample size but there is a scope to increase
this number. The present study as scientific as possible, limitations like, reluctance to divulge accurate information by the respondents; a perception that management is not an important components of the organization; limited information about process of quality circles and quality culture of the organization; and a purported lack of time, couldn't be avoided and the researcher feels that they are inevitable in survey studies of this type. There is also a dearth of literature on quality circles in organization from this study and hence should be cautiously analysed, since the sample study area and subjects are limited.

The investigation is limited to one selected city, that is, Visakhapatnam with five depots, the sample is confined to 100 subjects and the investigator has presented the profiles of the study area in the next chapter.

1.18 Chapterisation

The present study is formulated into five chapters. The first chapter is introduction which deals with the transportation, the importance of public transportation and the role it plays in transportation of passengers from one place to other. The development of Road Transport Corporation (RTC) and its role in urban transportation is also elaborated in this chapter. The significance of the study, objectives, hypothesis, research methodology and limitations of the study are analysed in this chapter. The review of earlier studies which are closely related with the current study is also included in this chapter. Here the researcher
has gone through the previous studies not only from Indian but also foreign studies for more reliability and strengthen the present investigation.

In the second chapter “Profile of APSRTC Visakhapatnam”, evolution of APSRTC is discussed. The organizational structure of APSRTC Visakhapatnam is also presented in this chapter. This chapter also presents different changes that took place at different levels in the formation and functioning of urban depots in Visakhapatnam city.

In the third chapter “The Personnel Management”, classification employees, different categories of employees and their duties are presented. Along with this recruitment and training procedures, appointments etc. of employees are also presented.

The fourth chapter is on “Performance Appraisal and Empirical Study” of Urban Transport. In performance appraisal, performance based on selected financial and non-financial indicators are elucidated. The data are tabulated with coefficients of statistically calculated growth rate of performance indicators. In empirical study opinion based response of city bus passengers is presented.

The fifth chapter is the last chapter with “Summary, Conclusion and Suggestions”.

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