ORIGINAL RESEARCH PAPER

Engineering

IMPACT OF THE BUS AGE ON REVENUE EARNINGS CAPACITY – A STUDY IN A PUBLIC SECTOR STATE ROAD TRANSPORT CORPORATION

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ABSTRACT

After economic liberalisation in India, the relevance of competition has exponentially increased. The passenger road transport sector is no exception to this phenomenon. In contrast there has been an exponential growth of personalised and other modes of transport during the last two decades .One of the reasons for increasing the personalised and other modes of passenger transport is the continues degeneration in quality of services by the public transport system and raising level of expectations of public/ passengers.

The revenue earnings capacity of a bus depends on the number of passengers traveling in the bus subject to number of seats available in the bus and vehicle productivity in terms of kilometers. This depends upon the patronage of passengers in a competitive environment where passengers are having choice to choose other modes of private vehicles to perform their journey. Though it is general known phenomenon, that aged or old buses are not preferred to travel ,but the degree of impact and bus age wise impact is a matter to take the managerial decisions , like vehicle replacement and vehicle repairs and maintenance systems related issues. .

The influence of the bus age on the reliability of the bus running and its revenue earnings capacity is studied with a sample of 2107 buses operating in Andhra Pradesh State Road Transport Corporation (APSRTC), which is a state public sector under taking.

A survey on passengers perception on vehicle age and their degree of preference is also conducted and discussed in this paper.

The study and survey results clearly revealed that the revenue earnings capacity of a bus is significantly influenced by bus age, in spite of having professional preventive , bus maintenance systems are in place.

SUMMARY: The 2107 buses are segregated in15 groups according to their age in terms of kilometers run from the inception. The earnings per bus (EPB) realized in one year is taken. The vehicle reliability in terms of in service break downs and garage repairs , as reported by service drivers also analysed to study its impact on the vehicle reliability with age of the bus and consequential influence on the bus earnings capacity.

A survey on passengers perception on vehicle age and their degree of preference is also conducted and discussed in this paper.

The study and survey results clearly revealed that the revenue earnings capacity of a bus is significantly influenced by bus age, in spite of having professional preventive , bus maintenance systems are in place.

1.INTRODUCTION

Mobility of people from one place to another place is essential for sustainable development of a state or country. It not only contributes for economic growth, also helps in developing social, cultural relationships among the people.

Public transport system mostly comprises of passenger bus transport services offered by the state owned road transport undertakings and the private operators plying their vehicles under stage carriage permits. At present in India there are 53 state Road Transport Undertakings (SRTU) having a total number of 1.13 lakhs buses

After economic liberalization in India, the relevance of competition has exponentially increased. The passenger road transport sector is no exception to this phenomenon. In contrast there has been an exponential growth of personalised and other modes of transport during the last two decades .One of the reasons for increasing the personalised and other modes of passenger transport is the continues degeneration in quality of services by the public transport system and raising level of expectations of public/ passengers.

One of the objectives of the State Road Transport Undertakings in public sector is, to meet their expenses for day to day operation and also for its fleet replacement , fleet augmentation from their own resources.

In light of the above maximisation of revenue generation is a vital and most important activity for their existence. The revenue generation through bus operation, called traffic revenue constitutes about 95% of the total revenue in SRTU.

The revenue earnings capacity a bus depends on the number of passengers traveling in the bus subject to number of seats available in the bus and vehicle productivity in terms of kilometers. This depends upon the patronage of passengers in a competitive environment where passengers are having choice to choose other modes of private vehicles to perform their journey.

In the above context , the impact of the bus age on traffic revenue earnings capacity is studied with a sample of about 2107 buses of ANDHRAPARDESH STATE ROAD TRANSPORT CORPORATION (APSRTC) , analysed and discussed in this article.

2. VEHICLE PRODUCTIVITY AND REVENUE EARNINGS CAPACITY- IMPACT OF BUS AGE

Vehicle productivity is measured in terms of kilometers run by a vehicle in a day of 24 hours, is called , Average vehicle utilization (AVU).The earning capacity of a bus directly proposition to the vehicle productivity. The vehicle productivity generally depends on its scheduled kilometers of operation. How ever ,in SRTUs new or less aged vehicles are deployed on the routes with more kilometers of operation i.e high AVU.Other wise , relatively old buses are deployed on lower scheduled kilometers operation. It is the universal accepted phenomenon that the vehicle productivity (AVU) is greatly influenced by age of the bus .A study on 2107 buses plying in APSRTC , Kadapa zone shows the fact as shown at Table-1

The AVU is worked based on kilometers operated in a period of one year.

Table-1

	AGE WISE AVU	
S.NO.	**AGE GROUP (Lakh KMs)**	**AVU (KMs)**
1	Below 1	474
2	Ab. 1 upto 2	459
3	Ab. 2 upto 3	447
4	Ab. 3 upto 4	435
5	Ab. 4 upto 5	419
6	Ab. 5 upto 6	405
7	Ab. 6 upto 7	394
8	Ab. 7 upto 8	389
9	Ab. 8 upto 9	385
10	Ab. 9 upto 10	380
11	Ab. 10 upto 11	317
12	Ab. 11 upto 12	271
13	Ab. 12 upto 13	260
14	Ab. 13 upto 14	249
15	Above 14	241
	AVERAGE	**368**

It clearly shows that the AVU decreases as the bus age increases. The reasons for this are many. The main reasons are reliability factor i.e as the bus age increases reliability of vehicle in running is affected.

Here reliability means in service break downs and Garage repairs(RGs) which is influenced by vehicle age , in spite of having professional preventive maintenance practices in place in APSRTC.

To measure the reliability factor two parameters ore considered.

1. Break down Rate (BDR) –is number of in service break downs for 10000 KMs of vehicle running.
2. Garage Repairs (RG) Rate- is number of garage repairs reported by sevice drivers of vehicle in a period of 10000 KMs vehicle running.

The garage repairs (RGs) are pre-condition of on line break downs. The effective handling of these RGs ultimately leads to failure free of bus service.

The in service break downs and Garage repairs are having a significant impact on the vehicle reliability in terms delayed supplying the vehicle for service, some times even cancellation of the scheduled service kilometers, there by a significant influence on the vehicle productivity(AVU), besides poor image of corporation in public .

Effect of over aged vehicles on traffic revenues,

- *Fall of revenue earning capacity due to low vehicle utilization(AVU) and poor reliability*
- *Poor image in public, may cause, deflection of traffic to other modes of private vehicles*
- *Image of the Undertaking means*

(a) Frequency of failures
(b) Period of down time
(c) Frequency of attention

Table-2

	AGE WISE RELIABILITY AND EPB				
S.NO.	**AGE GROUP (Lakh KMs)**	**BDR**	**RGR**	**RELIABILITY FACTOR**	**EPB (Rs)**
1	Below 1	0	3.56	3.56	11503
2	Ab. 1 upto 2	0	4.48	4.48	10487
3	Ab. 2 upto 3	0	6.49	6.49	10552
4	Ab. 3 upto 4	0.01	7.43	7.45	10063
5	Ab. 4 upto 5	0.01	9.94	9.96	9441
6	Ab. 5 upto 6	0.02	10.86	10.90	8695
7	Ab. 6 upto 7	0.11	11.18	11.40	8130
8	Ab. 7 upto 8	0.09	11.34	11.52	7488
9	Ab. 8 upto 9	0.06	11.19	11.31	6572
10	Ab. 9 upto 10	0.09	11.04	11.22	6477
11	Ab. 10 upto 11	0.11	14.13	14.35	5185
12	Ab. 11 upto 12	0.12	16.63	16.87	4280
13	Ab. 12 upto 13	0.16	16.44	16.76	3967
14	Ab. 13 upto 14	0.15	20.31	20.61	3932
15	Above 14	0.17	21.69	22.03	4021

The Reliability factor worked based on the Break down rate and RG Rate. The BDR is given weightage of twice that of RG Rate. The working of Reliability factor and corresponding Earnings per bus (EPB) in rupees is shown in the Table -2
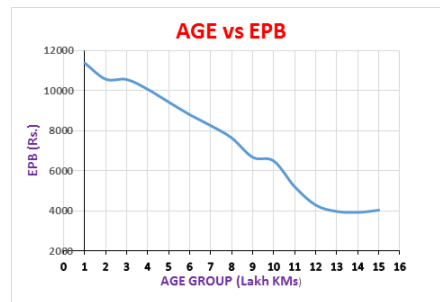
FIGURE-1
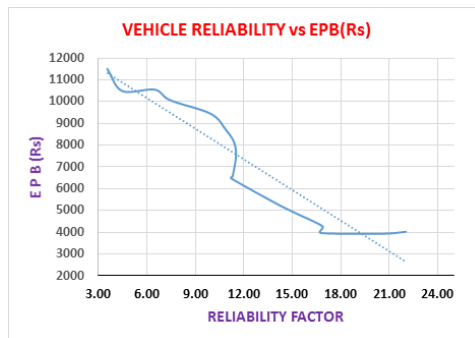
The Graphical presentation of the reliability factor and Earnings per bus(EPB) is shown at Figure-1

The Graphical presentation of Age of the bus and Earnings per bus is shown at Figure-2

FIGURE- 2

Karl Pearson's coefficient of correlation and t- statistic values are computed to test significance of association , degree of correlation. The degree of correlation between bus age and earnings per bus (EPB) is high and negative at -0.9878.The association is also significant at 5% level of significance. Similarly the regression equation is

$Y = 11865 – 594 X$
Where Y= Earnings per bus(EPB) in rupees
X = bus age in Lakhs kilometers

Similarly the Karl Pearson's coefficient between vehicle age and reliability factor is found at 0.9690, which is high degree of correlation, but positive side. The association is also found significant at 5% level of significance.

The regression equation is

$Y = 3.06 + 1.18 X$
Where Y= reliability Factor of bus
X = bus age in Lakhs kilometers

From the above analysis , it can say that the revenue earnings capacity of a bus in transport organization is greatly influenced by age of the bus. This is in spite of professional and effective preventive maintenance practices are in place.

3.PASSENGER'S PERCEPTION SURVEY ON BUS AGE
Generally passengers prefer to travel in buses of good condition, better appearance and cleanliness. In fact, passengers do not know the mechanical condition and age of the buses.

To know the influence of age of the bus towards degree of their preference to travel, a survey was conducted at Kurnool and Allagadda bustations, where both the towns are located on

National highway. More over more number of buses of different types and different age are running through these towns.

METHODOLOGY

A suitable questionnaire was designed to know the profile of the passengers to be surveyed, and also rating of the parameters on vehicle quality in passenger's point of view to know the degree of preference based on age of the bus in which they are travelling.

The places selected for the survey are Kurnool and Allagadda bus stations. The reasons for selecting these places are (1) Both the towns are located on national highway.(2) More number of APSRTC buses of different types and different aged buses are running through these towns. Hence passengers are having some choice even among APSRTC buses.

Total 2000 passengers, @ 1000 each of long distance travelling in special type of buses and short distance rural passengers in Telugu velugu (Ordinary) type buses are surveyed.

All the passengers surveyed are segregated according to their travel in different age group of buses. The buses are grouped according to their age in Kilometers in the groups of

Less than 2 Lacks Kilometers Age
Above 2 Lakhs Kilometers age up to 4 Lakhs kilometers age
Above 4 Lakhs Kilometers age up to 6 Lakhs kilometers age
Above 6 Lakhs Kilometers age up to 8 Lakhs kilometers age
Above 8 Lakhs Kilometers age up to 10 Lakhs kilometers age
Above 10 Lakhs Kilometers age up to 12 Lakhs kilometers age
And above 12 lakhs kilometers age

On an average 100 to 350 passengers were surveyed travelling in each age group of buses.

Seven key parameters which reflect the quality of buses in the perception point of view of the travelling passengers are chosen for eliciting the opinion of the passengers towards degree of preference of their travel. These are explained below.

1. SPEED OF THE BUS: The parameter is most favored criteria of preference.
The speed of the bus depends mostly on road condition, mechanical condition of the bus and driver skills. However, the age of the bus is also is having a considerable impact as the age of a bus is also a factor on the mechanical condition of a bus.

2.BUS BODY SOUND: This bus body rattling sound, greatly depends on the age of the bus. Passengers travelling in the bus directly feel the impact of the bus body sound.

3. CONDITION OF WINDOW SHUTTERS AND SHUTTER GLASSES: Though this is a part of bus body, the condition of window shutters & shutter glasses is having a great impact on the comfortableness of travel.

4.BUS SEATS CONDITION: This parameter is having highest degree of impact on the preference of travel and directly visible.

5. BUS APPEARANCE: This parameter includes painting both internal and external painting, dents, scratches and damages on bus body looking shabby appearance. It is quite natural the old aged buses are having more chances of getting dents, scratches and damages. In spite of attending these defects regularly, the appearance is not as good as that of new buses.

6. CONDITION OF LUGGAGE RACKS: This is a parcel rack provided inside the bus, where passengers can keep their luggage of less weight / sizes. Roof top luggage rack with ladder is also provided to keep heavy weights or big size luggage.

7. CLEANLINES: This includes sweeping and washing of buses. This parameter mostly depends on the daily maintenance rather than the age of the bus. But age of the bus is also having some impact on this parameter, as parts of busybody, seat frames,

shutter frames may not be as amenable to wash or sweep/clean in respect of aged buses as that of new buses.

All the above quality parameters chosen for the survey are being attended regularly as a part of preventive maintenance practices in the depots of APSRTC. Yet the degree of appearance, quality may not be as equal as that of new buses.

RESULTS OF THE SURVEY - SUMMARY

The perception of passengers on different quality parameters as described above are rated as good, satisfactory and Bad.

The summary of the number of passengers and percentage of their rating on each quality parameter for different age group of buses in which they were travelling are tabled and shown at Table-3

Table-3

S.NO.	AGE (Lakh KMs)	NO.OF PASSENGERS SURYED	PERCEPTION RATING	SPEED OF THE BUS		BUS BODY SOUND		WINDOWS CONDITION		BUS SEATS CONDITION		BUS APPEARANCE		LUGGAGE RACK CONDITION		CLEANLINESS OF BUS	
				G&S	BAD	G&S	BAD	G&S	BAD	G&S	BAD	G&S	BAD	G&S	BAD	G&S	BAD
1	< 2 Lakh KMs	550	NO.	512	38	498	52	481	69	513	37	532	18	512	38	400	150
			%	93	7	91	9	87	13	93	7	97	3	93	7	73	27
2	2 to 4 Lakh	550	NO.	504	46	484	66	450	100	470	80	498	52	457	93	363	187
			%	92	8	88	12	82	18	85	15	91	9	83	17	66	34
3	4 to 6 Lakh	100	NO.	68	32	64	36	58	42	70	30	72	28	70	30	62	38
			%	68	32	64	36	58	42	70	30	72	28	70	30	62	38
4	6 to 8 Lakh	350	NO.	254	96	214	136	208	142	240	110	199	151	229	121	215	135
			%	73	27	61	39	59	41	69	31	57	43	65	35	61	39
5	8 to 10 Lakh	200	NO.	142	58	97	103	117	83	130	70	89	111	83	117	84	116
			%	71	29	49	52	59	42	65	35	45	56	42	59	42	58
6	10 to 12 Lakh	150	NO.	101	49	60	90	83	67	103	47	74	76	71	79	81	69
			%	67	33	40	60	55	45	69	31	49	51	47	53	54	46
7	ABOVE 12 Lakh	100	NO.	61	39	38	62	45	55	44	56	28	72	53	47	45	55
			%	61	39	38	62	45	55	44	56	28	72	53	47	45	55
	TOTAL	2000	NO.	1642	358	1455	545	1442	558	1570	430	1492	508	1475	525	1250	750
			%	82	18	73	27	72	28	79	22	75	25	74	26	63	38

G&S. - Number / percentage of passengers rated as Good or satisfactory on the perception parameter
BAD - Number / percentage of passengers rated as Bad on the perception parameter

From the Outcome of the survey it is revealed that
(a) More than 80% of the passengers travelling in buses of less than 4 lakhs kilometers age are rated as good & satisfactory in respect of all quality parameters except for cleanliness.
(b) The percentage of passengers rated as good & satisfactory is gradually decreasing as the age of the bus in which they were travelling is increasing.
(c) The perception rating as good & satisfactory for different quality parameters is 73% to 97%, average of all parameters 90% of the passengers travelling in buses of age less than 2 Lakhs age. Whereas the percentage of passengers travelling in the buses of age above 12 lakhs rated as good & satisfactory is only between 28% to 61% for different parameters and average of all parameters is 45% only.
(d) Similarly, the percentage of passengers traveling in buses of 2 to 4 lakhs kilometers age rated as good& satisfactory Is between 66% to 91 % for different parameters and average of all parameters is 84%.
(e) The percentage of passengers traveling in buses of 4 to 6 lakhs kilometers age rated as good& satisfactory Is between 58% to 72% for different parameters and average of all parameters is 66%
(f) The percentage of passengers traveling in buses of 6 to 8 lakhs kilometers age rated as good& satisfactory Is between 57% to 73% for different parameters and average of all parameters is 64%
(g) The percentage of passengers traveling in buses of 8 to 10 lakhs kilometers age rated as good& satisfactory Is between 42% to 71% for different parameters and average of all parameters is 53%.
(h) The percentage of passengers traveling in buses of 10 to 12 lakhs kilometers age rated as good& satisfactory Is between 40% to 67 % for different parameters, the average for all parameters is 55% of passengers.

In respect of cleanliness parameter, the percentage of passengers of all age group buses rated as good & satisfactory is on lower side compared to that of other quality parameters. This may be due to cleanliness of bus more depends on the daily washing / sweeping

activity than age of the bus. However, the percentage of passengers rated as good& satisfactory is decreasing as the age is increasing. This is due to amenability to sweep/wash/clean is good for new or less aged buses.

On the whole the survey clearly revealed that passengers preferred less aged buses if choice is available. Otherwise the earning capacity of new or less age buses is more by attracting more number of passengers barring all other affecting conditions are similar.

Hence the age of bus is a great impact on the degree of preference of travel which decides the earnings capacity of the bus.