profitability arises if costs are less than 100% of revenues, toward the right of the chart.

For **jeepney**, the charts show the profitability is strongly influenced by passenger trip length (Figure 4.29). Almost all the very profitable routes have average trip lengths below 2km (i.e., revenue of P1.25 or more per passenger km). In general, those routes with longer trip lengths are only marginally profitable, cost between 80 and 120% of revenue.

While on any individual route, load factor (Figure 4.28) will be crucial to viability, over the whole database, it is not clearly correlated with profitability. There are profitable routes with load factors as low as 20% and loss-making routes with load factors above 75%.

Likewise, there is a clear correlation between speed and viability (Figure 4.30). All the slowest routes (below 5 km./hr.) are profitable. They are also all short, with high revenue per passenger km., while some of the fastest (inter-urban routes in the adjacent provinces) are loss-making.

Ordinary Bus presents a different picture. Load factor (Figure 4.31) is crucial, with a strong correlation between vehicle occupancy and profitability. This is largely because average trip length is longer–as passengers on all routes are paying roughly the same fare per km. The number carried on each vehicle has a greater bearing on profitability.

The apparent positive correlation between average trip length and profitability (Figure 4.32) may be due to the combination of city and provincial operations in the same chart. Below 15 km. (City) the same negative correlation observed for jeepney can be detected. Routes with low trip length are the most profitable (however, see Figure 4.31, these are also the routes with the highest load factors, and it may be load factor rather than the marginally higher fare per passenger km. that causes the profitability). Above 15 km. (Provincial) almost all routes are profitable. (Again, there is a link with load factor–on provincial services, it is rare for more than one person to occupy a seat during a vehicle trip, the longer the passenger trip the more passenger km. there are, and the fewer empty seat km., i.e., load factor is higher.)

A similar relationship can be observed in Figure 4.33. Slower speed implies greater profitability for city services, higher speed brings greater profitability for provincial services. Given the output from VOCM (see Figures 4.7 and 4.10) indicating that cost per vehicle km. is higher at low speed, the city result is counter-intuitive, suggesting strong correlation between vehicle speed and trip length (and possibly load factor).

FIGURE 4.28
CORRELATION BETWEEN ROUTE PROFITABILITY AND LOAD FACTOR – JEEPNEY

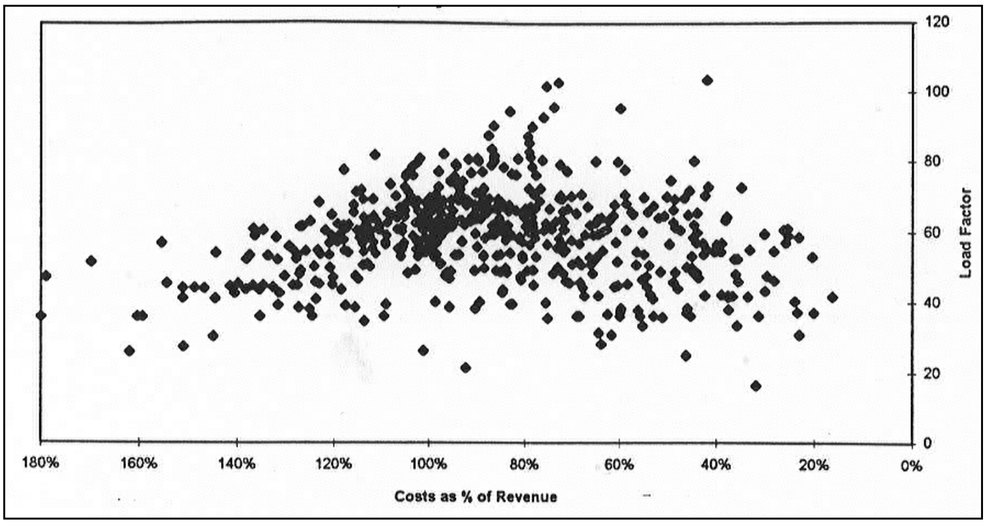


FIGURE 4.29
CORRELATION BETWEEN ROUTE PROFITABILITY AND PASSENGER TRIP LENGTH – JEEPNEY

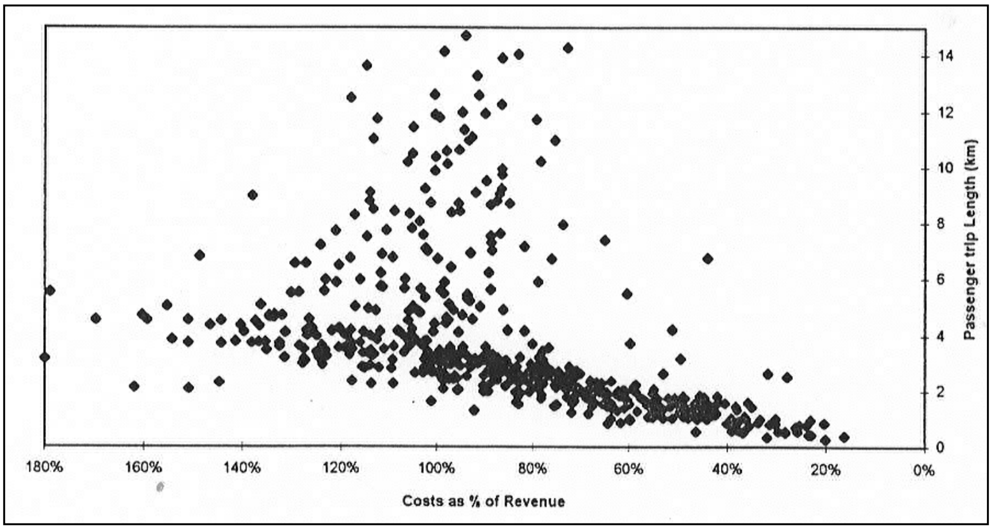


FIGURE 4.30
CORRELATION BETWEEN ROUTE PROFITABILITY AND AVERAGE SPEED – JEEPNEY

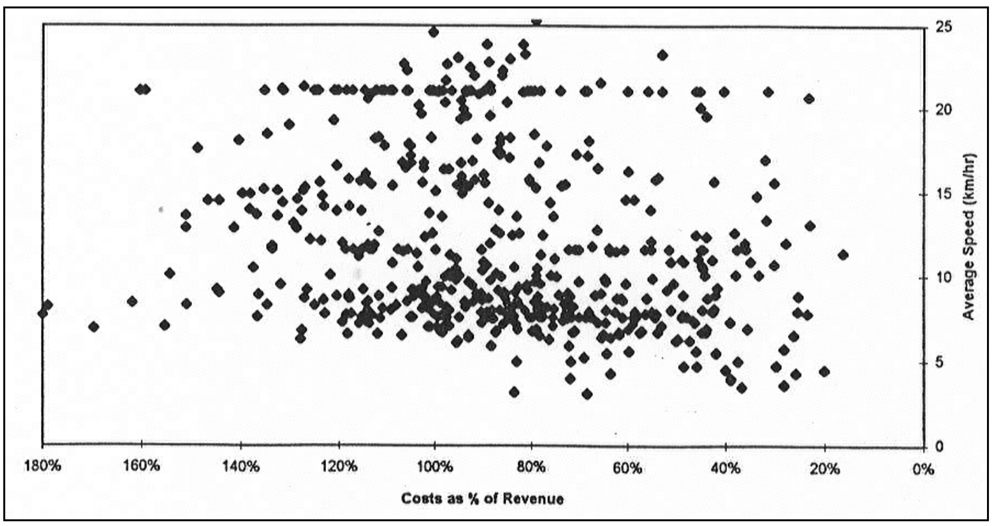


FIGURE 4.31
CORRELATION BETWEEN ROUTE PROFITABILITY AND LOAD FACTOR – ORDINARY BUS

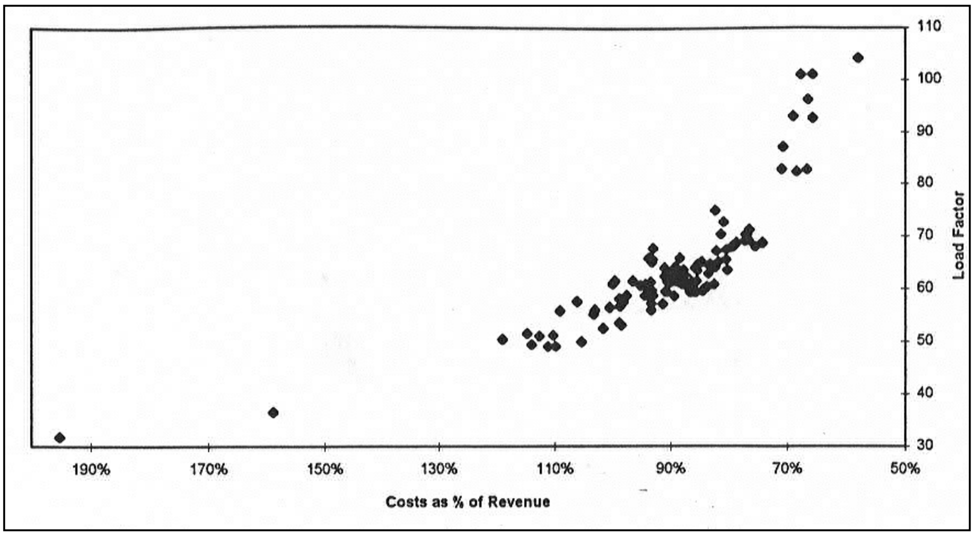


FIGURE 4.32
CORRELATION BETWEEN ROUTE PROFITABILITY AND PASSENGER TRIP LENGTH – ORDINARY BUS

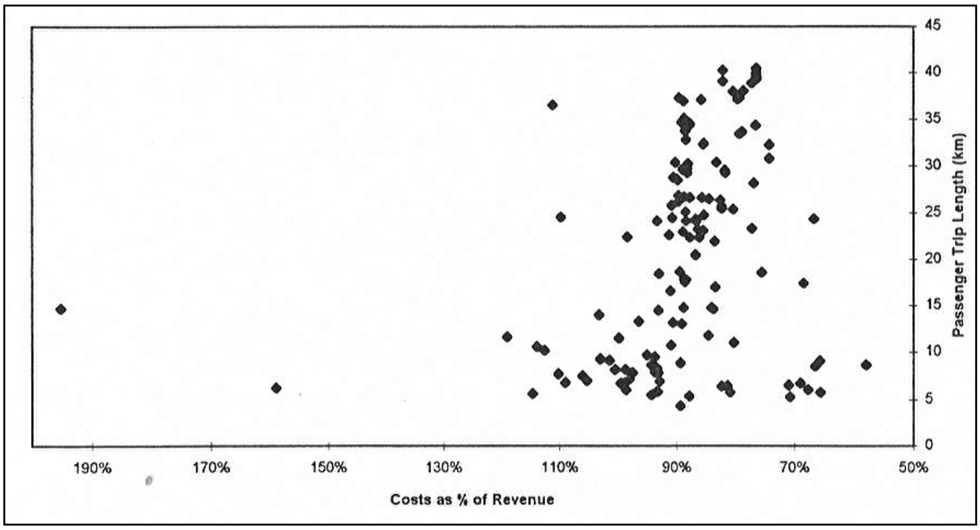


FIGURE 4.33
CORRELATION BETWEEN PROFITABILITY AND AVERAGE SPEED – ORDINARY BUS

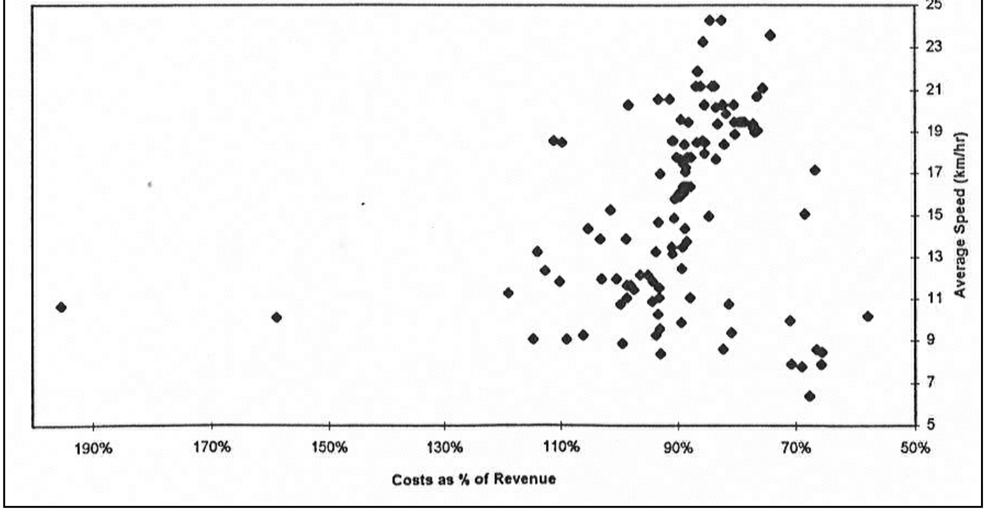


FIGURE 4.34
CORRELATION BETWEEN ROUTE PROFITABILITY AND LOAD FACTOR – AC BUS

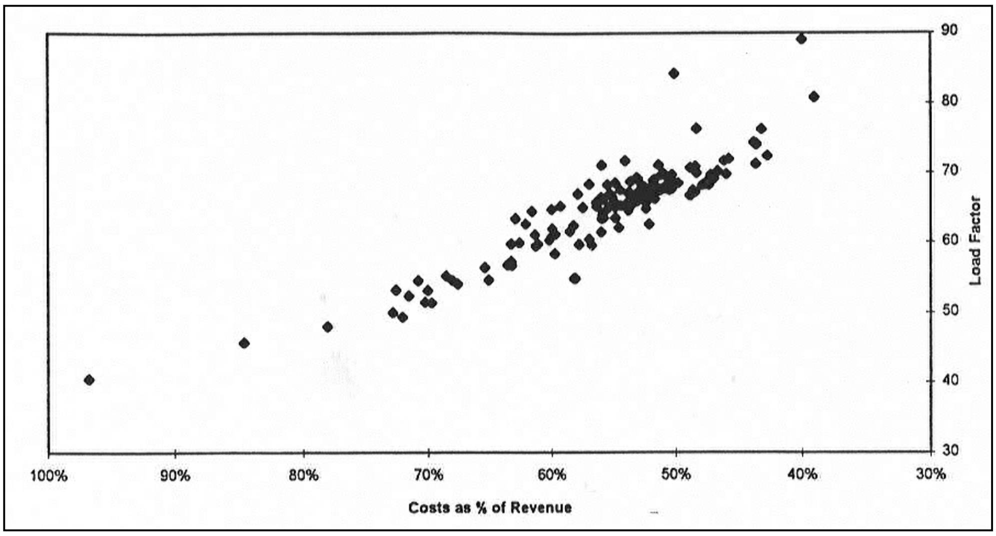


FIGURE 4.35
CORRELATION BETWEEN ROUTE PROFITABILITY AND PASSENGER TRIP LENGTH – AC BUS

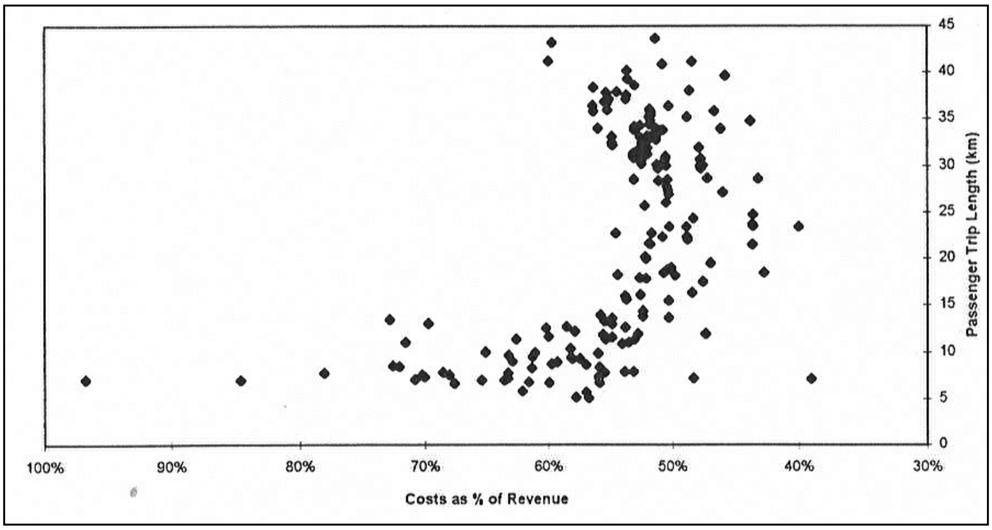
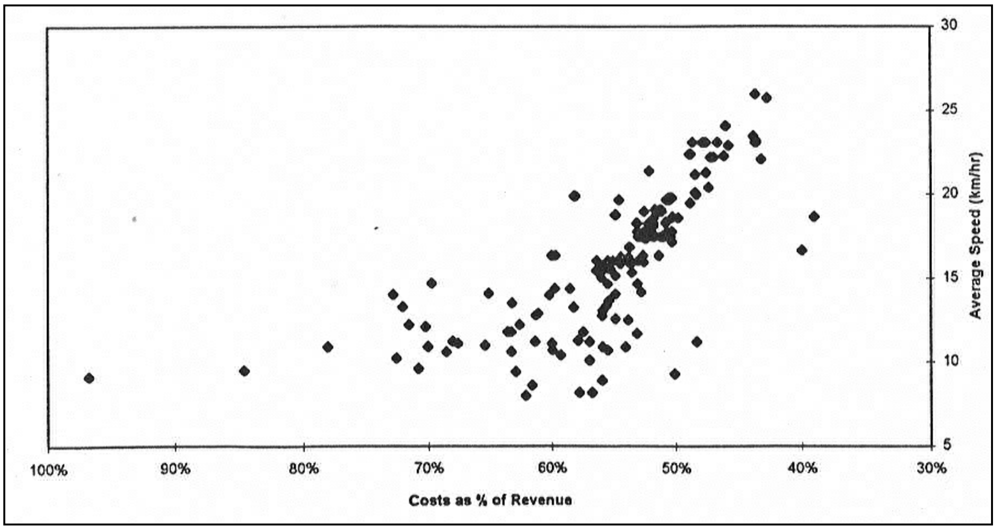


FIGURE 4.36
CORRELATION BETWEEN ROUTE PROFITABILITY AND AVERAGE SPEED – AC BUS



The charts for **Air Conditioned Bus** appear to show clear relationships between level of profitability and all three explanatory variables being tested.

As expected, Figure 4.34 shows profitability is positively correlated with load factor. As with ordinary bus, fare per passenger km. is similar on all routes, so those with more passengers will be more profitable. All routes appear to be comfortably profitable, even with load factors as low as 40%.

The different trip length profitability relationships for city and provincial operation detected in Figure 4.32 (Ordinary Bus) are more explicit in Figure 4.35. At low trip length (City), there is a tendency to higher profitability at low trip length (the minimum AC fare extends to 6 km., rather than 4 but, unlike the jeepney, there are few routes on which the average passenger rides a shorter distance traveled and profitability. With no difference in fare/km., this suggests an inverse correlation between trip length and load factor.

Figure 4.36 displays the theoretically expected positive correlation between speed and profitability, particularly for provincial routes (faster than 15 km./hr.), as cost per vehicle km. falls continuously with higher speed throughout the range of speeds observed in the MMUTIS routes survey.

It is interesting to note, comparing all three charts, that the routes with the highest load factor (Figure 4.34) appear to be provincial (Inter-urban) routes, also having high speeds (Figure 4.36) and most having average trip lengths above 20 km. (Figure 4.35)

The overall picture is, thus, of comfortable profits—the costs output by VOCM already include an average 15% return on capital employed–and apparent excessive profits for most AC bus operations. There are, however, a number of ordinary bus and jeepney routes which seem to be at best breaking even, and some jeepney routes which are definitely not covering their full costs as estimated by VOCM. Possible measures to reduce costs are reviewed below.

4.4.2 Reducing Cost

The cost output by VOCM are based on standard long-run operator behavior aimed at being able to replace the current vehicle when its life expired. Operating conditions in Metro Manila could be regarded as non-standard, even for the Philippines, so some of the assumptions underlying the cost estimate might not be reflected in actual driver or operator practice.

Vehicle Utilization

As a significant proportion of full annual vehicle operating costs (interest, part of depreciation, overheads) are in reality fixed, one way of reducing cost/hr or /km is to work the vehicle harder (i.e., increase the utilization over which the costs are spread). There are three main ways of doing this, namely:

- Extend the vehicle's working life;
- Increase the km. run or hours worked in a year, or

- Increase the proportion of running hours to total hours (i.e., eliminate standing hours).

As can be seen from the 'lifetime' columns in Tables 4.3 to 4.5, at the low speeds typical of public transport operations in Manila, the VOCM assumes extended vehicle lifetimes[3].

Extension of jeepney working life beyond the model's assumptions might be possible but, at 10km/hr depreciation, only contributes ₱30,000/yr (over a 12-year working life) to annual cost of over ₱200,000. Extending life to 15 years would reduce this charge to ₱24,000, a saving of only 3% on cost per km, while probably resulting in maintenance cost higher than assumed in VOCM.

Likewise, increasing the work done is difficult for jeepneys and buses on city routes. Vehicles are already assumed to operate for around 4,000 hours a year at the average speeds recorded in the database (see Figures 4.3 and 4.4), equivalent to over 13 hours a day for 300 days a year. Any further increase in km (and thus, hours) run involves putting more vehicles on the road at times of low(er) passenger demand. Load factors, and thus profitability, would probably fall by more than cost per km.

The DPWH assumptions on vehicle utilization underlying the VOCM output involve quite a high proportion of standing hours relative to running hours (particularly for jeepneys) when operating at the free flow speed (shown by the white bars in Figures 4.1 and 4.2). However, at the speeds encountered in Manila standing hours are a much smaller proportion of overall hours, particularly for bus, and there does not seem to be much prospect, in practice , to reduce them by converting them to running hours or eliminating them.

Bus operators seem to have the greater freedom in this area, as they usually control a number of vehicles (or all of them) on a particular route and can determine the length of any layover at the terminal, particularly on city routes. Even here, some standing time will be needed for a rest break for the crew, watering and fueling the bus, minor maintenance, etc. Furthermore, only crew costs for standing hours are actually saved–all other elements of time cost are fixed and will be re-apportioned across the revised number of hours use.

Jeepney operators are constrained in the extent to which they can eliminate standing hours (only assumed by VOCM to be 900 hours per year–less than 3hrs per day–at 10 km/hr running speed). In traditional methods of jeepney operation, a number of individual driver/operators will combine resources to run a route, with each vehicle awaiting its allotted turn at terminals. Standing time, thus, depends more on the number of vehicles operating on the route at the time and level of passenger demand at the terminal (influencing how fast the vehicle at the head of the queue fills up and moves off), than on the individual preference of the driver or operator.

There would not, therefore, seem to be much opportunity to reduce cost per hour or km by increasing utilization for vehicles of any type operating on the slower routes in Metro Manila, although there may be some scope for extending vehicle lifetime or

[3] Possibly unrealistically long in the case of the new bus, i.e., VOCM underestimates the depreciation element for this vehicle, which would contribute to the high level of profitability of AC bus that has been derived.

annual work done (particularly by reducing standard hours relative to running hours on some routes with average speeds above 20km/hr[4]).

Disregarding Elements of Operating Cost

The indication of non-profitability for a route in Section 4.1 does not mean that vehicle operators are immediately aware that the route is non-viable. As long as cash flow (revenue less day-to-day expenditure) remains positive, the operator can continue in business for some time before the failure of revenue to cover full cost becomes a problem.

The capital cost of the vehicle, which appears in VOCM as depreciation, is a 'sunk' cost. Once incurred, it need not enter into the operator's profitability calculations again until the vehicle's life expires and it needs replacement.

Likewise, the interest charge included in VOCM represents an entrepreneur's return on capital invested in the public transport industry.[5] Unless the capital has actually been borrowed from a bank, with interest charges and re-payments made, this is also not a cost which needs to be met out of daily revenue.

The structure of the jeepney industry means that the driver of the vehicle is usually self-employed, hiring a roadworthy vehicle with a route franchise from an "operator" on a daily or weekly basis and needing only to cover the vehicle rent ("boundary"), fuel and incidental cost out of revenue in order to make a "profit". There are no crew wages, as included in VOCM, which have to be met at the end of the working day, rather the driver's surplus of revenue over his out-of-pocket expenses is his return on investment of human capital–a working day–in driving the jeepney

There are three elements of annual operating cost as calculated by VOCM which can, at least, be temporarily disregarded by operators while still staying in business. These are:

- Depreciation (annualized capital consumption of the cost of a new vehicle);
- Interest (acceptable return on the capital invested); and
- Jeepney crew costs.

Operators can, thus, survive a short downturn in profitability on a route (e.g., if cost increases or revenue decreases due to a temporary factor such as major roadworks), surviving on a lower net-revenue stream for some time (often a number of years) before there is a serious problem. However, leaving any of these costs out of the calculation for too long will lead to the operator leaving the industry, either voluntarily of after being forced out.

[4] This might be limited by the hour of day (or night) at which the bus reaches the terminal – it may be several hours before there is enough passenger demand to make the return trip worthwhile.

[5] And any profit – revenue over and above VOCM cost is strictly a 'super-normal' profit in economic terms

Inclusion of depreciation in the costs to be taken into account when measuring profitability ensures that funds are available for replacement of the vehicle when its life expires. A revenue stream too low to cover depreciation and fund replacement vehicles has been a long-standing problem for the Manila bus industry. This seems to have been resolved via a combination of reconditioned buses and an increasing proportion of (high revenue) AC operation[6].

As noted, interest costs may either be real–if the purchase cost of the vehicle has been borrowed (in which case they cannot be ignored in determining even short-run profitability)–or are included to represent the income that could have been earned on the money invested, i.e., they represent the entrepreneur's return on capital employed (ROCE).

ROCE can be ignored in computing day-to-day profitability, but if it cannot be covered by revenue, it suggests that the entrepreneur would be better off investing in a different industry. Switching capital to another industry under these circumstances may not, of course, be possible. If revenues for the public transport industry as a whole are deficient, the entrepreneur may experience difficulty in finding someone to buy out his investment. The investor is then trapped in the industry, and has to accept low or zero ROCE. However, under these circumstances the entrepreneur would not invest any new funds in the industry, and in the long run there will be the same shortage of replacements for life-expired vehicles. Interest is a legitimate part of long run vehicle operating cost.

The "boundary" system in use for the overwhelming majority of jeepneys means that there are in effect two operators for each vehicle, namely:

- the owner, who incurs depreciation, interest, most maintenance, and some overhead costs; and
- the driver, who directly incurs fuel, oil and some maintenance and overhead costs, and indirectly incurs all the other costs via the boundary fee.

Jeepney drivers do not, therefore, have the option of temporarily ignoring the capital element of operating cost, as it has been internalized, via the boundary fee, in their daily cash expenditure[7]. On the other hand, they do not actually incur crew costs, a surplus of revenue over cost becoming their 'wage'. A jeepney driver could, thus, survive a downturn in revenue by not taking any money out of the business until revenue had recovered or he had solved the cash flow problem by finding another owner whose boundary free more accurately reflected the potential profitability of the route. However, a 13-hour day driving in Manila traffic for no money does not represent a good return on the driver's human capital employed, and it is unlikely that drivers will remain in the industry for long if they need to ignore their own 'wage' in order to stay in business.

[6] At the time of the MMUTIS surveys, there were 229 AC routes in the Study Area, and only 144 ordinary. The respective levels of daily activity were (Ordinary in parentheses): Vehicle trips 19,576 (13,368); Vehicle km. 654,481 (471,701); Person trips 1,835,681 (1,369,767); Passenger km. 25,207,877 (17,192,547). It is understood that AC has increased its share of the market in the following 15 months.
[7] Unless there is a surplus of vehicles on offer franchised for a route and owners are having to ignore these costs and lower their boundary fee in order to attract drivers to rent vehicles from them.

It is interesting to note that VOCM costs jeepney crew at ₱26.88 per hour, including social taxes and insurance, at 3rd quarter 1997 prices, equivalent to ₱350 for a typical 13-hour day (4,000 hours per year). The average driver's net income derived from answers to the 4th quarter 1996 MMUTIS jeepney driver survey was ₱318[8].

Jeepney owners are pure entrepreneurs. They invest in a vehicle, which will be franchised for a particular route. If the route is profitable, they will be able to command a high boundary fee and share in the profitability with the driver. They will also wish to invest more capital in that particular sub-market (replacing older vehicles or adding new ones if franchises are available). If the route does not generate much revenue, they will not be able to command a high boundary, and may have to forego the depreciation and/or interest elements of their vehicle operating costs in order to get drivers to rent it (under these circumstances some owners may drive the vehicle themselves).

"Direct" Costs

The VOCM has been used to generate a set of vehicle operating costs ignoring depreciation and interest, i.e., indicating the minimum, direct cost per vehicle km. that revenues would need to cover day-to-day expenditure. Jeepney crew cost has been retained in these estimates as it is considered that if revenue did not cover this cost, the driver would seek an alternative source of income.

Bar charts derived from VOCM output are presented as Figures 4.37 (Jeepney), 4.38 (New Bus) and 4.39 (Reconditioned Bus). Figures 4.40, 4.41 and 4.42 represent these costs compared with the full costs of Figures 4.5 to 4.7. Curves have been added to show cost per vehicle km. under full- and direct-cost recovery conditions.

As with the full costs presented in Section 2, direct costs have also been calculated at the full range of low speeds encountered. The equivalent data to that presented in Tables 4.3 to 4.5 and Figures 4.8 to 4.10 is shown in Tables 4.6 (Jeepney), 4.7 (New Bus) and 4.8 (Reconditioned Bus) and Figures 4.43 (Jeepney), 4.44 (New Bus) and 4.45 (Reconditioned Bus). For completeness, charts comparing full and direct cost at low speed are presented at Figures 4.46 (Jeepney), 4.47 (New Bus) and 4.48 (Reconditioned Bus).

It can be seen that, not surprisingly, excluding capital charges from the annual costs has the greatest impact on the running cost of the most expensive vehicle type, new bus.

It is also, clear, particularly in Figure 4.47, that new bus also exhibits the greatest difference between full and direct cost.

It is interesting to note, from Figures 4.42 and 4.48, that ignoring capital charges has a very limited impact on cost/km. for reconditioned bus. These cost elements do not make a significant contribution to full cost for the second-hand vehicle. Indeed,

[8] It is further interesting to note that computed driver's net incomes per day ranged from P1500 to 770, suggesting under-declaration of either income or costs by some drivers, but remarkably similar to the range of jeepney profitability revealed by the analysis of the MMUTIS Jeepney routes database presented in Section 4.1 above.

comparing Tables 4.7 and 4.8, it can be seen that direct cost of the reconditioned vehicle is actually higher than the direct cost of a new vehicle, due to the assumption in VOCM of higher maintenance cost for reconditioned bus. Thus, in periods when revenues are too low to cover full cost, the second-hand vehicle ceases to have a competitive advantage and becomes a liability to its owner.

Overall, therefore, it would seem that there are few opportunities for operators to make any significant reduction in the cost of operating buses or jeepneys unless they have decided to leave the industry once their existing vehicles' life expired.

TABLE 4.6
VEHICLE UTILIZATION AND ANNUAL DIRECT COST AT LOW SPEED – JEEPNEY

Vehicle Cost to be Depreciated over Time - Crew Cost per Hour 26.88
Annual Interest Charge - Overheads as % of Full Costs 5%
(19% on 50% of the fleet)

Average Speed (km/hr)	Distance Related Costs		Time Related Costs				Total Cost		
	'000 km. run	Annual Cost	Lifetime	Dept'n/	Hours	Annual Cost	Per year	Per km. run	Per hr. run
3	21.71	42,612	13,17	-	8,014	230,955	273,567	12.60	37.80
4	22.29	43,733	12.92	-	6,367	184,580	228,313	10.24	40.98
5	22.86	44,855	12.69	-	5,388	157,020	201,875	8.83	44.16
6	23.43	45,976	12.46	-	4,741	138,868	184,844	7.89	47.34
7	24.00	47,097	12.25	-	4,286	126,093	173,190	7.22	50.51
8	24.57	48,219	12.05	-	3,949	116,677	164,896	6.71	53.69
9	25.14	49,340	11.85	-	3,692	109,501	158,841	6.32	56.86
10	**25.71**	**50,461**	**11.67**	-	**3,490**	**103,893**	**154,355**	**6.00**	**60.03**
11	26.29	51,208	11.49	-	3,328	99,399	150,607	5.73	63.03
12	26.86	51,937	11.32	-	3,197	95,759	147,696	5.50	65.99
13	27.43	52,651	11.16	-	3,089	92,775	145,426	5.30	68.93
14	28.00	53,348	11.00	-	3,000	90,307	143,655	5.13	71.83
15	28.57	54,029	10.85	-	2,925	88,251	142,280	4.98	74.70
16	29.14	54,694	10.71	-	2,862	86,530	141,224	4.85	77.53
17	29.71	55,342	10.57	-	2,809	85,085	140,427	4.73	80.34
18	30.29	55,974	10.43	-	2,764	83,869	139,843	4.62	83.11
19	30.86	56,590	10.31	-	2,726	82,846	139,436	4.52	85.86
20	**31.43**	**57,189**	**10.18**	-	**2,694**	**81,986**	**139,176**	**4.43**	**88.57**

TABLE 4.7
VEHICLE UTILIZATION AND ANNUAL DIRECT COST AT LOW SPEED – NEW BUS

Vehicle Cost to be Depreciated over Time - Crew Cost per Hour 54.88
Annual Interest Charge - Overheads as % of Full Costs 10%

Average Speed (km/hr)	Distance Related Costs		Time Related Costs				Total Cost		
	'000 km. run	Annual Cost	Lifetime	Dept'n/	Hours	Annual Cost	Per year	Per km. run	Per hr. run
5	31.11	235,469	17.86	-	6,870	470,420	705,889	22.69	113.45
6	32.00	242,197	17.50	-	6,000	418,911	661,108	20.66	123.96
7	32.89	248,924	17.16	-	5,384	382,733	631,657	19.21	134.44
8	33.78	255,652	16.84	-	4,926	356,136	611,788	18.11	144.90
9	34.67	262,380	16.54	-	4,574	335,927	598,307	17.26	155.33
10	**35.56**	**269,107**	**16.25**	-	**4,296**	**320,189**	**589,296**	**16.57**	**165.74**
11	36.44	274,336	15.98	-	4,072	307,459	581,795	15.96	175.60
12	37.33	279,492	15.71	-	3,889	297,156	576,647	15.45	185.35
13	38.22	284,574	15.47	-	3,736	288,716	573,290	15.00	194.99
14	39.11	289,583	15.23	-	3,608	281,739	571,322	14.61	204.51
15	40.00	294,520	15.00	-	3,500	275,928	570,448	14.26	213.92
16	40.89	299,383	14.78	-	3,407	271,063	570,446	13.95	223.22
17	41.78	304,173	14.57	-	3,328	266,975	571,148	13.67	232.41
18	42.67	308,889	14.38	-	3,259	263,532	572,422	13.42	241.49
19	43.56	313,533	14.18	-	32,00	260,631	574,164	13.18	250.46
20	**44.44**	**318,104**	**14.00**	-	**3,148**	**258,188**	**576,291**	**12.97**	**259.33**

TABLE 4.8
VEHICLE UTILIZATION AND ANNUAL DIRECT COST AT LOW SPEED – RECONDITIONED BUS

Vehicle Cost to be Depreciated over Time	-	Crew Cost per Hour	54.88
Annual Interest Charge	-	Overheads as % of Full Costs	10%

Average Speed (km/hr)	Distance Related Costs		Time Related Costs				Total Cost		
	'000 km. run	Annual Cost	Lifetime	Dept'n/	Hours	Annual Cost	Per year	Per km. run	Per hr. run
5	31.11	261,813	10.71	-	6,870	451,842	713,656	22.94	114.69
6	32.00	269,294	10.50	-	6,000	400,204	669,498	20.92	125.53
7	32.89	276,77	10.30	-	5,384	363,897	640,671	19.48	136.36
8	33.78	284,255	10.11	-	4,926	337,172	621,427	18.40	147.18
9	34.67	291,735	9.92	-	4,574	316,835	608,570	17.55	157.99
10	**35.56**	**299,215**	**9.75**	-	**4,296**	**300,970**	**600,185**	**16.88**	**168.80**
11	36.44	305,197	9.59	-	4,072	288,166	593,362	16.28	179.09
12	37.33	311,105	9.43	-	3,889	277,791	588,896	15.77	189.29
13	38.22	316,940	9.28	-	3,736	269,283	586,223	15.34	199.38
14	39.11	322,702	9.14	-	3,608	262,240	584,942	19.96	209.38
15	40.00	328,391	9.00	-	3,500	256,367	584,758	14.62	219.28
16	40.89	334,007	8.87	-	3,407	251,442	585,449	14.32	229.09
17	41.78	339,549	8.74	-	3,328	247,297	586,847	14.05	238.80
18	42.67	345,019	8.63	-	3,259	243,800	588,819	13.80	248.41
19	43.56	350,415	8.51	-	3,200	240,848	591,263	13.57	257.92
20	**44.44**	**355,739**	**8.40**	-	**3,148**	**238,356**	**594,095**	**13.37**	**267.34**

FIGURE 4.37
ANNUAL DIRECT COSTS – JEEPNEY

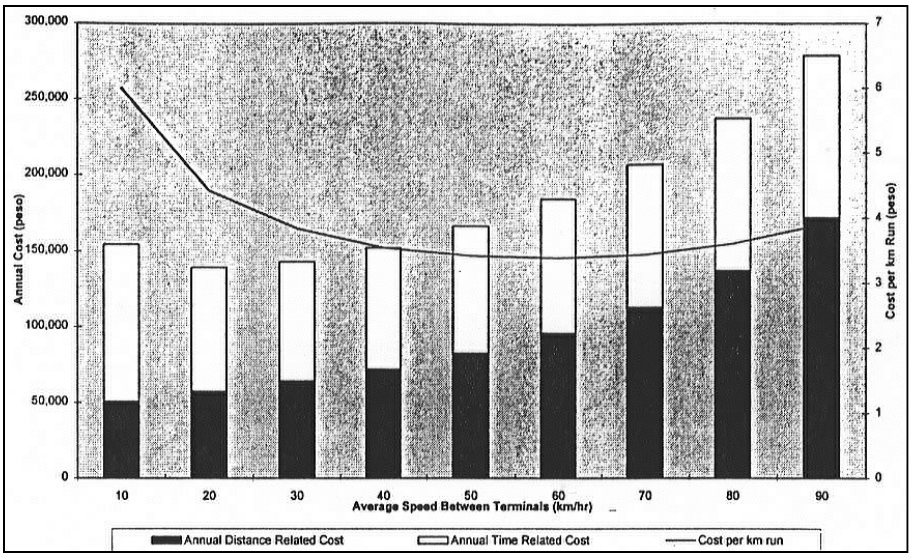


FIGURE 4.38
ANNUAL DIRECT COSTS – NEW BUS

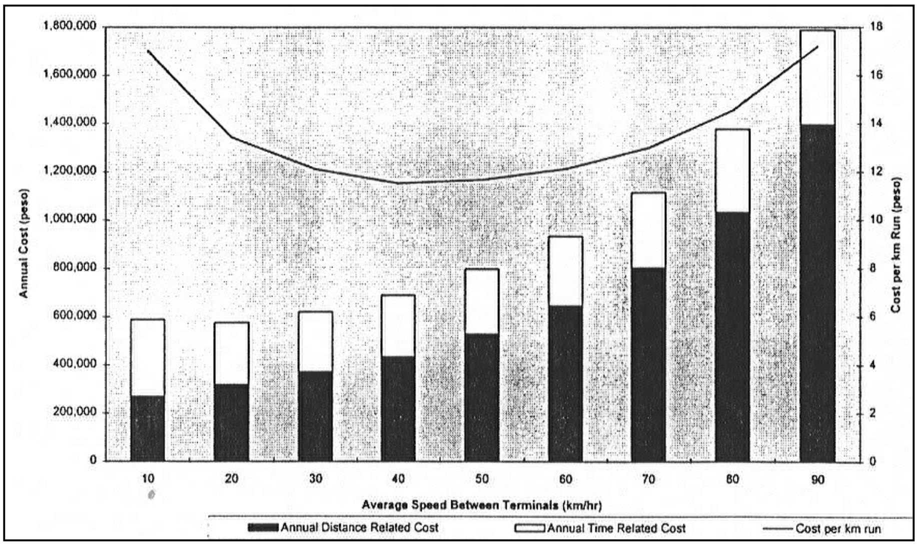


FIGURE 4.39
ANNUAL DIRECT COSTS – RECONDITIONED BUS