

AN ANALYSIS OF NON - WHITE TRANSPORT
REQUIREMENTS IN AN EASTERN CAPE
URBAN AREA

Thesis presented in fulfilment of the requirements for the degree of
Master of Commerce

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PREFACE

The following research is centred around the Grahamstown non-white urban transportation problem. The bus service under consideration is owned and operated by the Grahamstown Municipality and is attached to the City Fire Department. It caters only for non-white commuters by operating fourteen buses, which carry approximately 1 200 000 people per year. As such, the difficulties encountered by this transport service should be generally, though not entirely, applicable only to relatively small non-white transport undertakings.

The aims of this research are threefold :

1. to establish the environment within which transport undertakings operate, the structure of the undertaking in response to this environment and the problems which such undertakings encounter in their daily operations ;
2. by analysing in detail a specific transport service, an attempt has been made to delineate problem areas in both the cost and revenue structures, and to ascertain the degree of management awareness of the existence of these problems ; and
3. to determine the social impact of this transport operation and to evaluate all aspects of the service in relation to commuters, business and social needs and wants.

Unfortunately, an attempt to extend this type of research to further Eastern Cape urban areas was unsuccessful due to the refusal by certain transport undertakings and government bodies to provide essential information.

ACKNOWLEDGEMENTS

It is always an invidious task to attempt to acknowledge all those who have lent fruitful assistance to ones personal effort and I, therefore, hope that those who go unmentioned here will understand that they do not go unforgotten.

Thanks must be given to the following people for their help and understanding, patience and humour, and for the many hours they spent attempting, not for their own benefit, to apply normative theories to practical situations : Professor H H Smith, Professor M L Trew, Associate Professor F E Drennan, Dr "Terry" Contogiannis, Professor P J Welgemoed, Mr B C Floor, Dr G A Cook, Mr P A Black, Mr F S Collis and Mr R G J Macintosh, all of whom contributed generously of their time and knowledge.

Special mention must be made of the Grahamstown City Council who afforded me the opportunity of conducting this research by making available all necessary data and allowing many hours of consultation with personnel directly involved with the Municipal Bus Service. In this respect, Mr L Hickman, the Transport Manager and Mr D C Lowe, the City Treasurer were of immeasurable benefit.

A final word of thanks must go to Mr B E Freeman and Mr B Hiscock of the Bantu Affairs Administration Board who provided an enlightening insight into the socioeconomic life of the non-whites in the Grahamstown area.

I sincerely hope the results of the following research have been of some tangible benefit to the Grahamstown Transport Committee.

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THE URBAN TRANSPORT PROBLEM AND ITS IMPACT

1. An Overview

The transport problems associated with urban growth and the concentration of economic activity have, in the past, enjoyed a substantial amount of investigation and analysis. It is doubtful, however, whether all this attention has resulted in the proposing of any solutions possessing the necessary dual characteristics of being fundamentally able to solve the problem while being practical enough to consider implementation. The situation is at present aggravated by existing global economic conditions in that few governments have the available finance to embark on expansive corrective action programmes, and hence many 'major problems' must accept a relatively low policy rating. The continued existence of the present urban system dictates that transport conditions deteriorate at ever increasing marginal rates.

In the first instance, road standards are usually in an inverse relation to traffic needs as highways in open rural areas generally degenerate to narrow right-of-ways in urban areas. The resulting urban congestion leads to a very slow rate of traffic movement - calculated at 10 kms - 15 kms in large American centres. (1) The obvious effect of this decrease in mobility is a corresponding fall in the economic efficiency of the area. This is essentially an unavoidable external diseconomy inherent in the present system. In historical perspective, the situation is somewhat paradoxical in that urban concentration was impossible without the mobility and the supply lines afforded by transport, yet the same concentration now threatens to strangle the transport that made it possible.

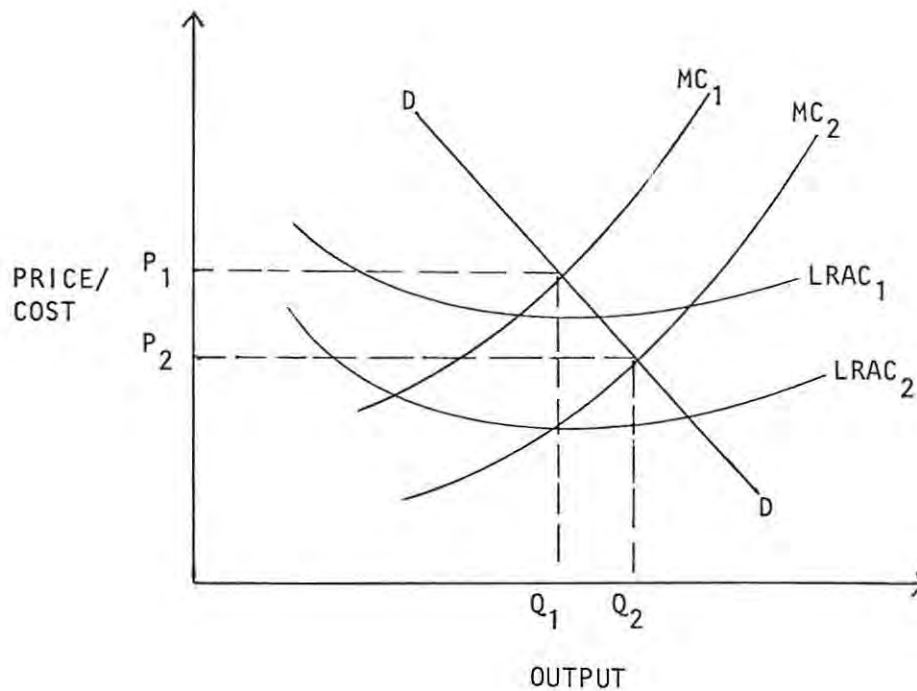
(1) OWEN W : "The Metropolitan Transportation Problem"
Bookings Institute Washington 1966 Page 2

The public transport operator is undoubtedly faced with further difficulties which only serve to aggravate his already precarious position. He must attempt to reconcile the benefits of providing extra capacity during peak periods with the cost of idle capacity during slack periods. Constantly rising costs have resulted in substantial tariff increases and decreased patronage, while the high cost of replacing and maintaining equipment has resulted in the continued use of obsolete facilities. The provider of a transport service has, then, been placed in the unenviable position of having to carry fewer people at a greater cost and in a less and less suitable environment.

Transport problems, however, are not only limited to those facing the operator. From the point of view of the commuters, inefficiencies and congestion do little to motivate the workforce on arrival at the place of employment. In fact, the daily battle with congestion is in sharp contrast with general improvements in working conditions. The worker may now tend to perceive his job as a daily evil not because of the job itself, but because of the problems associated with getting to work.

Very seldom today is any public transport undertaking viable in financial terms. Yet the service it provides in enabling the continuation and growth of external economics in urban centres is invaluable. The increased mobility afforded to the factor input of labour is synonymous with an increase in the availability of labour. Assuming that this relative abundance is put to intelligent use by production units within the region, each should experience a decrease in his unit cost of output. In normative terms, a decrease in production costs leads automatically to an increase in output.

Diagram 1:1

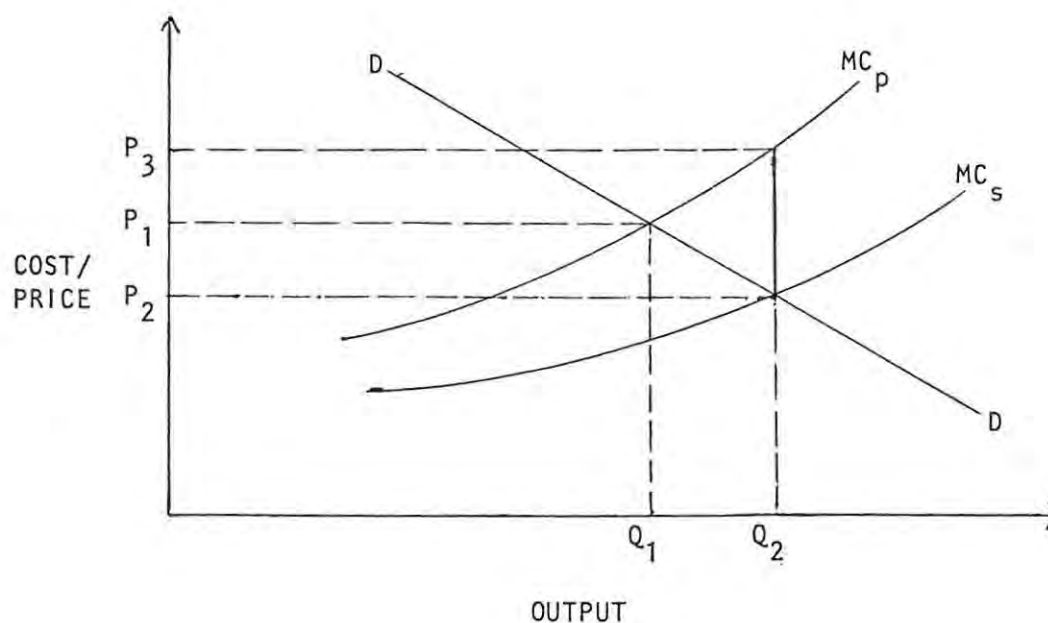


Assuming that LRAC is the firm's initial long run average cost curve and MC is the corresponding marginal cost curve. (By definition the firm's marginal cost curve is also its supply curve.) Before the existence of a mass transport system, the firm will react according to the demand curve with which it is faced (D D) and its existing supply curve (MC_1). The initial equilibrium will, therefore, materialise at a price P_1 with a corresponding output of Q_1 . Once a public transport service is added to the system, we can expect, from the benefits derived, that the firm's unit cost of output will fall. Long run average cost now decreases from $LRAC_1$ to $LRAC_2$ and the associated marginal cost from MC_1 to MC_2 . Given that the demand for the firm's output remains constant, a new equilibrium will be found at the lower price P_2 with a greater output Q_2 . In order to preserve this situation, many governments have been forced to nationalise transport services so that they can be financed from government tax sources. Failing this, huge subsidies have had to be made available to cover ever increasing losses.

Experience has shown that the balancing diseconomics associated with urban development and congestion, have nowhere appeared to be reaching an intensity where they can counteract the advantage of external benefits, and hence it appears that the problem has no foreseeable limitations. In fact, the situation has arisen that whenever transport and related facilities are improved, the resulting increase in user demand is so phenomenal that the problem is only intensified. This would suggest that corrective action must at least provide for a remodeling of the entire urban system - a step so drastic that it is seldom, if ever, contemplated seriously. The nearest substitute, which is proving to be of high cost and dubious benefit, is that of encouraging external growth points where urban planning can at least start on the right foot and where transport requirements can be integrated with urban design in the most efficient manner.

Any perfunctory study will, therefore, indicate that the transport problem throughout the world is not going to be easily solved. However, it has been disturbing to economists and politicians alike how the inherent difficulties of the industry have led to an attitude of laxity and inefficiency within the transport undertakings themselves. Both management and staff tend to lose all incentive for efficiency on the assumption that the year end financial report will show a loss regardless. This is perhaps one of the most distressing aspects of the transport problem. Given that there are numerous factors existing within both the operator's macro- and micro-environment, which make profitable returns difficult to achieve, it becomes of paramount importance to ensure that efficiency is at a constant maximum. When constraints on profitability are not actively fought and controlled, operating loss will become exorbitant. When public transport systems are viewed in welfare economic terms, as providing a positive externality, the necessity for efficiency becomes patently clear.

Diagram 1:2

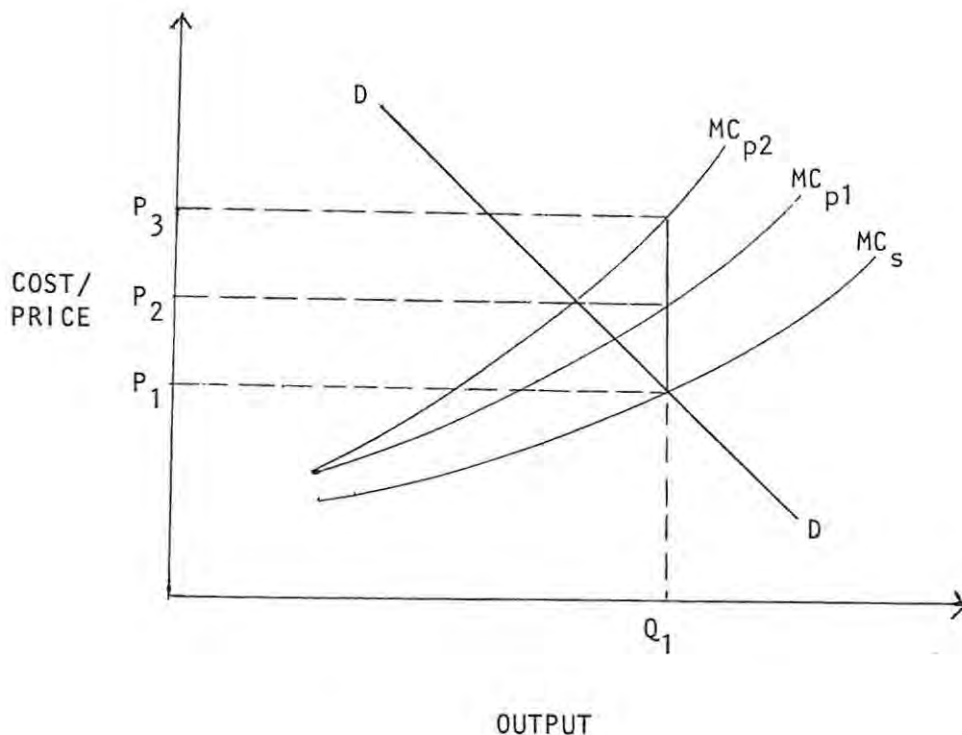


The function MC_p represents the marginal cost incurred by the transport operator. MC_s is the marginal cost incurred by society due to the existence of a public transport system. * The producer, reacting to the demand curve facing him and in accordance with his own private marginal cost, will

* The relative positioning of MC_p and MC_s is explained as follows : Commuters do not make journeys solely for the purpose of getting from A to B. At their destination they will take part in some activity which may be economic in nature, social in nature, or both simultaneously. This activity will not only be of benefit to the commuter, but also to the third party who formed the reason for the journey. For example, an employer, friend, retail outlet, audience, etc. In effect, then, the third party has received a benefit which would not have been available, or would have been less available, had a transport service not existed. Moreover, the third party has not paid for this benefit or utility. If all benefits received were paid for then MC_p would be the same as MC_s . But the increase in social welfare, arising from the existence of a public transport system, is synonymous with a decrease in social cost. Hence MC_s lies below MC_p .

produce an output Q_1 at a price P_1 . On the other hand, if the intention of the operator was to maximise social welfare, he would produce, according to social marginal cost, an output of Q_2 at a price P_2 . Given that transport operators are generally conscious of the role they play in society it may be expected that in practice price/quantity equilibriums tend towards this latter category. However, at output Q_2 the producer incurs a cost P_2P_3 which is not covered by incoming revenue. This is the size of the subsidy he must receive in payment for the social benefit he produces. If equity is the dominant criteria, then this subsidy should be paid by the people and institutions within the region concerned, each being liable for an amount compatible with the benefit they receive. In practical terms this is impossible and the liability is placed in municipal or, alternatively, government hands.

Diagram 1:3



It is fundamental that the size of the subsidy will be strongly influenced by the efficiency of the transport service. In Diagram 1:3 MC_{p1} represents the marginal cost structure of an efficient operation. If this concern were to lose efficiency, it would incur greater unit costs at every level of output ; hence MC_{p1} shifts to MC_{p2} . This means that at a constant level of production (Q_1) the subsidy necessary to keep this service operating increases from P_1P_2 to P_1P_3 . This type of analysis provides a very strong case for local or national government intervention in, or control of, passenger transportation services. The body responsible for the subsidy has a right to ensure that such a subsidy is not paying for inefficiency. However, this approach suggests that fundamentally transport undertakings should become state or municipal monopolies ; which means that the normal yardstick of efficiency - competitors profit or cost performance - does not exist. To overcome this problem, undertakings have to resort to the use of efficiency audits, which are very difficult and costly forms of control, or to the comparison of the performance of different transport monopolies in different parts of the country. This latter technique has its limitations in that each undertaking will operate in a different environment and hence valid comparisons will have to make allowance for differences in topography, congestion, urban spread and so on. The effect of such factors is difficult to quantify in monetary terms.

2. The South African Transport Situation

In a sense South Africa has the same type of transport problem as other developed countries throughout the world. She has an enviable growth rate and her development nodes are spreading rapidly - handling 62% of retail trade and 70% of manufacturing production at present. (2) There is a

(2) MCRYSTAL L : "The Driessen Report and White Paper - an Assessment"
National Development Management Foundation 1975 Page 4

constant influx of workers, or potential workers, to the cities; and urban congestion, together with the resulting diseconomies, is on the increase. In order to relieve congestion and promote a more efficient spatial distribution of production, South Africa, like most other developed nations, is encouraging industrial decentralisation. The appointment of the Driessen Commission and the subsequent tabling of the Commission's Report are evidence that transport problems are coming to a head.

The management of bus transport undertakings in South Africa may be categorised into three organisational forms :

- a) transport companies which operate as private undertakings ;
- b) buses which are owned by a municipality, but which are controlled and managed by an autonomous transportation board ; and
- c) buses which are owned and operated as part of the municipal organisation.

The private company is, in general, committed to the provision of as good a service as possible, with the proviso that there is some kind of acceptable return on investment. By virtue of their nature, these companies have limited access to funds needed in times of financial difficulties. To prevent such companies from taking action which may be necessary to relieve their financial position, but which may be damaging to commuters and the region concerned, subsidies are probably more easily available to them than to companies operating under other forms of ownership and control.

The idea of having a bus fleet under the control of a transportation board places less emphasis on profit. The board in fact is placed in a managerial position to ensure that a good service is implemented while the books are balanced over a number of years.

Municipal operations exist largely for the sole purpose of providing a public service. Profit is seen as a secondary motive while at the same

time a sincere attempt is made to avoid excess losses.

Whether it can be shown that the different forms of ownership and control actually result in the provision of different levels of service is doubtful. It is often claimed that private companies offer a better service, but this may be due to the fact that they have chosen to operate in areas with more suitable topography and urban spread. It is also difficult to show that the profitability of different companies is related to the tariffs charged as those undertakings which make the greatest loss are not necessarily those which charge the lowest prices. In this connection, it is in fact commonly held that public transport fares are too low throughout most of the world, and that commuters would willingly pay more to get a more comfortable and more convenient service. Reisch claims that for political and other reasons, transit fares are consistently maintained at levels below those necessary for economic operation and that the results are disastrous. (3) The same author points out that there are four unfortunate myths surrounding the public transport problem :

1. it is untrue that transport prices must be low. A reasonable rise in fares would not be significant for most people, but it would be most important for the transit industry ;
2. it is often assumed that an increase in prices tends to a decrease in patronage which results in a reduction of service and a further increase in prices. This assumption is incorrect as, on the one hand price increases have been necessitated by cost escalation, and on the other hand decreasing patronage has been due to a secular change away from public transport, as economic welfare and affluence increase ;
3. transport policy is often to provide cheap transport for poor people.

(3) REISCH D : "Problems of Mass Transportation"
New York 1970

The result is underinvestment and finally no transit at all or, at least, poor transport for poor people ; and

4. it is often held that transport cannot pay its way because the peaks in traffic are an inherent diseconomy. This appears fallacious when considering holiday resorts, theatres and the like, which often experience far more severe peaks.

It would appear that transport companies must stop viewing the role they play as mass transit. Only by concentrating more on the needs of the individual are they going to draw people away from other far more costly, yet more convenient forms of travel. There may be some commuters who are unable or unwilling to pay for good transport services, in which case they can either be subsidised or, in the true capitalist sense, the market can be left to find its own equilibrium. As far as the Black commuter is concerned, other forms of transport create little competition at present, but as the economic position of the non-white improves, and other more convenient forms of transport fall within their means, the transport undertakings could find themselves in the same predicament as their white colleagues, who are facing ever decreasing patronage. They are, however, in the fortunate position of being able to follow developments, if any, made previously by operators of white transit services.

Although recent South African transport statistics are difficult to obtain analysis of, past facts and figures highlight some interesting trends. From 1962 to 1970, the number of non-whites transported by bus increased at an average rate of 2,4% per annum (from 174-204 million). However, the fact that in 1970 this growth rate was actually negative (-0,4%) indicates a dramatic swing away from this type of transport. (4) In contrast, the number of whites transported over the same period decreased by an average

(4) VERBURGH C WELGEMOED P J AND CILLIERS H F I : "Die Stad en Sy Verkeer" Rand Afrikaanse Universiteit 1973 Derived from Table 4 Page 51

of 2% per annum (from 210-179 million). In view of these statistics, it is interesting to note the number of buses used to transport the different racial groups. (Table 1:1)

Table 1:1

COMPARISON OF TOTAL NUMBER OF BUSES USED
FOR WHITES AND NON-WHITES 1962 - 1970 (5)

YEAR	WHITES	%	NON-WHITES	%	TOTAL
1962/3	1 625	81	389	19	2 013
1963/4	1 704	81	409	19	2 113
1964/5	1 778	79	469	21	2 245
1965/6	1 787	78	490	22	2 287
1966/7	1 882	80	509	20	2 350
1967/8	1 829	79	517	21	2 306
1968/9	1 867	77	545	23	2 412
1969/70	1 815	75	607	25	2 422

Table 1:1 indicates that although the proportion of buses provided for non-whites is increasing, in 1970 white commuters were still using three times more buses than non-whites to transport 25 million fewer people. However, whether this can be construed as meaning that non-whites suffer a correspondingly lower level of service is doubtful. It must be remembered that from a spatial point of view, non-whites are generally grouped together in township areas and thus require proportionately fewer buses as they travel over a limited number of routes. White commuters are far more widely distributed and to provide a service for all areas necessitates the provision of a far greater number of buses. The question of non-white transport must in reality be treated as a

(5) VERBURGH C : op cit Derived from Tables 5 and 6, page 54 - 55

separate entity. To view South Africa's transportation problem as one integral concern would be blatant self-deception.

In the first instance, urban sprawl is forcing commuters throughout the world to travel further and further to work each day. This results in extra travel time, increased frustration and potentially decreased productivity. However, workers usually have a certain degree of choice as to whether they will reside close or far from the place of work. The South African non-white has no such choice and must travel daily from township to city. If he wishes to take up employment, he has no option but to endure the longer time spent in travelling, and his employer must accept the physiological and psychological effect so caused. This becomes of some significance in view of the fact that non-whites comprise approximately 70% of South Africa's total work force.

Secondly, the non-white person has, in general, no alternative but to use the public transport facilities provided. With a car ownership level of 10 in 1 000 he cannot, like the average white person, choose between private or public transit. (6) This point indicates the probability that demand for public transport by non-whites is far more inelastic than that for whites. It follows, therefore, that the non-white will tolerate a greater degree of efficiency and abuse on the part of the transport operator, before he will consider changing his demand pattern.

A further complicating factor is the question of equity. The average non-white commuter has a lower ability to meet his transport bill than the average white commuter, due to existing income differentials. To promote an equitable situation, therefore, fares charged to a non-white transport system should be far lower than those charged to whites - yet

(6) ADCOCK C : "The Driessen Report and White Paper - an Assessment"
National Development Management Foundation 1975 Page 30

the cost of providing the two systems at a given level of service may be practically the same. Given that it is socially justifiable to charge the non-white commuter low transport fares, there will be an enormous financial burden placed on the provider of the service. Does this mean, however, that non-white transport undertakings must, by nature, incur huge financial losses? Is it really a distressed industry? Are external or environmental factors solely responsible? The following research is an attempt to answer such questions with regard to the small operator.

To conclude this introduction, it must be emphasised that transport undertakings of different sizes will be faced with, in many respects, vastly different problems. A small company has the disadvantage of relative lack of capital; and the purchase of extra capacity, or in fact any asset, represents a much larger proportional capital outlay. Where the service is too small for staging the operator is forced to work with average costs and, therefore, average pricing to a far greater extent than the large company.

On the other hand, the small company also tends to have some very important advantages. In the first instance, the operator has a far greater degree of control over his service and it is quite possible for him to conduct a simple efficiency audit in order to regulate company performance levels. To add to this, the small service possesses a natural degree of flexibility which a large company could never have. Decisions can be more rapidly implemented which makes profitability more easily attained, as short run cost and revenue considerations can be more easily moulded towards the achievement of long run objectives.

PROFITABILITY ANALYSIS

Determining the relationship between costs and revenues, in terms of specified parameters, is, of course, of fundamental importance to efficient operation in any sphere. As far as public transport is concerned, an analysis of cost/revenue relationships is particularly useful in that it can be meaningfully related to the several variables set out below.

- (a) The day of the week. It is important to ensure that daily operating costs are compatible with revenue earned per day. The operator must, therefore, pay serious attention to the varying of carrying capacity in response to proven daily passenger trends.
- (b) Passengers carried. Relating costs and revenues to the number of commuters using the service indicates clearly the extent to which fare prices must alter in order to cover operating costs.
- (c) Distance travelled. It is important for the operator to be able to distinguish between those routes where an increase in the frequency of service will result in a net revenue inflow, and those where a decrease in frequency will lead to a greater cost reduction than revenue reduction.
- (d) Routes travelled. In general, management should ensure that the cost of operating a certain route is compatible with the revenue earned. However, it may be desirable, in certain circumstances, for profitable routes internally to subsidise others.

By analysing profitability from these various standpoints, management will gain a far more useful understanding of operating problems and potentials than if costs and revenue are viewed purely as annual totals.

When considering the level of costs, the following factors may be considered as the major determinants :

- (a) the size of the urban area ;
- (b) the topography of the urban area ;
- (c) the level of service offered by the undertaking ;
- (d) the concentration of carrying capacity on certain routes ;
- (e) the existing salary scales within the company ; and
- (f) the frequency, quality and cost of maintenance and repairs.

In the practical situation, however, an analysis of costs provides something of a problem. It is fairly simple, in theoretical terms, as shown above, to delineate those factors which will have an effect on the cost of the operation. However, the majority of such factors cannot be expressed in monetary terms to show the exact effect they have, or the influence they exert on the cost structure. The only solution, which is by no means satisfactory, is to attempt to rank each cost determinant according to its relative degree of importance. This still necessitates actual costs being treated as one agglomerated total which can only be divided into functional and not causal categories.

Revenue, on the other hand, is far more easily analysed in that it has a direct causal relationship with the number of commuters carried and the level of fare prices.

1. Cost Categorisation

According to an analysis of accounting records, total costs incurred by the Grahamstown Municipal Bus Service during 1975 amounted to R141 746,00. To delineate fixed costs from operating costs, the following categorisation was selected.

Table 2:1

FIXED COSTS		(R's)	OPERATING COSTS		(R's)
Electricity & Water		355	Salaries & Wages		38 021
¹ Establishment Charges		500	³ Miscellaneous		661
² Administration (Works Department)		720	Materials & Stores		925
Maintenance (Buildings)		569	Insurance		6 278
Loan Charges:			Equipment		2 519
(i) Interest		5 943	Petrol, Oil, Grease, Tyres		29 505
(ii) Redemption		26 365	Maintenance & Repairs (Bus)		29 385
		34 452			107 294

Categorising costs provided several problems in that the intention was to distinguish those costs which would either increase or decrease in the event of an alteration in the level of service offered. In the true sense these costs are not variable costs if variable costs are defined, as is usual, as those costs which will fall away if the undertaking ceases to operate. There is little question of this bus service being discontinued, so this definition of variable costs is not applicable. Any costs which will change with an alteration in the service level are operating costs in the truest

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- 1 These are charges payable to the municipality for general expenses incurred by it in respect of work done on behalf of the bus service, for example, selling season tickets.
 - 2 This is a charge payable to the bus service manager who is also responsible for the administration of the city's Works Department.
 - 3 Miscellaneous costs include several small items such as advertising, printing, stationery, postage and telephone.

sense. However, in the practical situation it is often difficult to determine exactly what operating costs are, as frequently only a portion of one cost figure may be operating cost while the rest may be partly variable and partly fixed. It is, therefore, necessary that the reasons for any cost breakdown be carefully explained. Those costs which comprise a small percentage of the total have been disregarded.

Fixed Costs

The major proportion of fixed costs occur in the form of loan charges - 94%. Such charges pertain to the purchase of buses bought with the use of loans which are paid off in equal installments over a period of five years. Such costs are easily classified as fixed in that should either the scale of service change or the service cease to exist entirely these costs would still be payable.

Operating Costs

Wages and salaries may be variable in the sense that any major alterations in the level of service offered would result in either the laying off of certain staff or alternatively an increase in manpower requirements. On the other hand, such costs are not variable in the sense that any minor adjustments in service will not necessitate an increase or decrease of employees. However, due to the fact that remuneration is directly related to the operation of the service and because, in the long run, this item will possess considerable variability it has been classified as an operating cost.

Materials, stores, insurance, equipment, petrol, oil, grease, tyres, maintenance and repairs are easily discernable as pure operating costs.

2. Cost / Revenue Analysis by Day of the Week

According to the 1975 timetable and the routes taken by each bus shift, the total distance covered by all buses was in the region of 290 000 kilometres. This method was deemed more reliable than using the actual recorded mileage of individual buses, as speedometer cable malfunctions are relatively common. In addition to the timetable mileage, there is a further 60 000 kilometres, being the distance covered on private hire and special runs. This gives a total annual distance travelled of 350 000 kilometres. Given the fact that total operating costs amounted to R107 294,00 (Table 2:1), operating costs per kilometre were calculated at 30.65 cents. This represents a 22,6% increase over the 1971 figure (25 cents) and a 39,3% increase over 1963 (22 cents). This indicates that the marginal rise in operating costs is becoming progressively greater. Table 2:2 relates operating cost to the daily distance covered by the service in order to determine the average operating cost by day of the week.

Table 2:2

AVERAGE TOTAL OPERATING COST BY DAY OF THE WEEK

DAY	KILOMETRES PER TIMETABLE	TRAVELLED PER PRIVATE HIRE, AND SPECIAL RUNS ⁺	COST PER KM.	TOTAL
Monday	840	165	30,65 cents	R 308,03
Tuesday	840	165	30,65 cents	R 308,03
Wednesday	840	165	30,65 cents	R 308,03
Thursday	840	165	30,65 cents	R 308,03
Friday	840	165	30,65 cents	R 308,03
Saturday	935	165	30,65 cents	R 337,15
Sunday	440	165	30,65 cents	R 185,43
	6 730			R2 026,73

⁺ Private Hire and special runs are unpredictable in nature and hence the total distance covered through these two services has been divided equally amongst each day of the week.

Due to the fact that there are no timetable differences during week days, these days incur an equal cost of R308,03. Increased frequency of service on Saturdays incurs a higher cost, whereas Sundays constitute a very small proportion of total weekly operating costs.

Having determined the average operating cost by day of the week, the next step in the analysis is to calculate average daily revenue. Total revenue for the year 1975 was R94 981,00, made up as follows :

(a) revenue from the sale of tickets at the point of entry into the bus	R57 068,00
(b) private hire	16 429,00
(c) special runs	9 492,00
(d) season tickets	11 988,00
	<u>R94 981,00</u>

Although total revenue is easily divided into the various earnings categories, it is impossible to subdivide costs accordingly. Revenue, like costs, therefore, has to be treated as though it comes from a single operational source. The monies obtained from private hire, special runs and season tickets were thus divided into an average revenue per day calculated at R103,85. This figure must be added to the average revenue earned by day of the week from the sale of tickets on buses.

Due to the fact that ticket prices naturally vary in accordance with the route taken, the only way of determining average revenue from daily ticket sales is by finding the average percentage of commuters purchasing the various tickets on each day. For example, a sample of Mondays can be taken to determine the percentage of commuters purchasing tickets of different prices on that day of the week throughout 1975. This is converted into a revenue figure through multiplying the number of people associated with each percentage, by the relevant ticket price.

A daily revenue analysis for 1975 can then be conducted as follows :

Monday

The total number of commuters carried = 181 858

The average number carried per Monday = 3 497

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	28	979	R 29,37
5 cents	47	1 644	R 82,20
7 cents	25	874	R 61,18
TOTAL	100	3 497	R172,75

Average total revenue from daily ticket sales R172,75

Revenue from season tickets, private hire &
special runs R103,85

Total average revenue per Monday R276,60

Tuesday

The total number of commuters carried = 164 971

The average number carried per Tuesday = 3 173

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	27	857	R 25,71
5 cents	45	1 428	R 71,40
7 cents	28	888	R 62,16
TOTAL	100	3 173	R159,27

Average total revenue from daily ticket sales R159,27

Revenue from season tickets, private hire &
special runs R103,85

Total average revenue per Tuesday R263,12

Wednesday

The total number of commuters carried = 175 184

The average number carried per Wednesday = 3 504

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	27	946	R 28,38
5 cents	45	1 577	R 78,85
7 cents	28	981	R 68,67
TOTAL	100	3 504	R175,90

Average total revenue from daily ticket sales R175,90

Revenue from season tickets, private hire & special runs R103,85

Total average revenue per Wednesday R279,75

Thursday

The total number of commuters carried = 186 420

The average number carried per Thursday = 3 585

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	27	968	R 29,04
5 cents	46	1 649	R 82,45
7 cents	27	968	R 67,76
TOTAL	100	3 585	R179,25

Average total revenue from daily ticket sales R179,25

Revenue from season tickets, private hire & special runs R103,85

Total average revenue per Thursday R283,10

Friday

The total number of commuters carried = 304 845

The average number carried per Friday = 5 862

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	30	1 758	R 52,74
5 cents	46	2 697	R134,85
7 cents	24	1 407	R 98,49
TOTAL	100	5 862	R286,08

Average total revenue from daily ticket sales R286,08

Revenue from season tickets, private hire & special runs R103,85

Total average revenue per Friday R389,93

Saturday

The total number of commuters carried = 106 388

The average number carried per Saturday = 2 046

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	36	737	R 22,11 .
5 cents	46	941	R 47,05
7 cents	18	368	R 25,76
TOTAL	100	2 046	R 94,92

Average total revenue from daily ticket sales R 94,92

Revenue from season tickets, private hire & special runs R103,85

Total average revenue per Saturday R198,77

Sunday

The total number of commuters carried = 23 348

The average number carried per Sunday = 449

TICKET PRICE	% OF COMMUTERS PURCHASING	NO. OF COMMUTERS	REVENUE EARNED
3 cents	25	112	R 3,36
5 cents	40	180	R 9,00
7 cents	35	157	R10,99
TOTAL	100	449	R23,35

Average total revenue from daily ticket sales R 23,35

Revenue from season tickets, private hire & special runs R103,85

Total average revenue per Sunday R127,20

Having determined average daily revenue, a comparison of these amounts with average daily operating costs enables the calculation of profit or loss incurred by day of the week. (Table 2:3)

Table 2:3

AVERAGE OPERATING PROFIT/LOSS BY DAY OF THE WEEK

DAY	OPERATING COST (R)	REVENUE (R)	PROFIT (R)	LOSS (R)
Monday	308,03	276,60		31,43
Tuesday	308,03	263,12		44,91
Wednesday	308,03	279,75		28,28
Thursday	308,03	283,10		24,93
Friday	308,03	389,93	81,90	
Saturday	337,15	198,77		138,38
Sunday	185,43	127,20		58,23
TOTAL	2 062,73	1 818,47	81,90	326,16
			244,26	

The daily profit / 24.

The daily profit and loss figures presented in Table 2:3 can undoubtedly serve as a solid foundation for executive action within the transport operation concerned. Such an analysis also makes possible the use of management by exception, in that corrective action can be applied to each day in order of financial burden incurred. However, at this stage, the analysis does not indicate the type nor degree of action to be taken.

Verification of Methodology

Due to the fact that the analysis thus far has, by necessity, been carried out largely with the use of samples and averages, it is incumbent upon the researcher to test the results obtained.

Company records for 1975 show a total cost of R141 746,00 (Table 2:1) and total revenue of R94 980,00, giving a loss for the year of R46 766,00. According to the preceding analysis of operating profit/loss by day of the week, this company incurs a weekly operating loss of R244,26 (Table 2:3) or R12 701,00 per annum. To this figure must be added the total fixed costs for 1975 of R34 452,00 (Table 2:1), which gives a total loss for the year of R47 153,00. The difference between this figure and the actual loss reflected in company accounts is R387,00 - a variance of 0,82% or approximately the cost of running the bus service for 1,25 days.

Although a certain degree of chance could be involved, the close correlation between the two figures, it is submitted, tends to lend credibility to the method used.

3. Profit/Loss per passenger

While daily profit and loss figures are of undoubted use to management, the potential performance of the transport service is clarified considerably if these figures are related directly to specific operational and profitability

factors. Such action will give a greater insight into the type and degree of remedy necessary.

In the first instance, it is important to determine the loss being incurred by the service per passenger, in that this will serve as a guideline in order to cover operating costs. According to records kept by the Municipality, this bus service carries 1 200 000 passengers per year. Given the fact that the total loss for 1975 was approximately R47 000,00, the loss per passenger is in the region of 3,9 cents. While a detailed analysis of the revenue structure and the factors influencing it is given in Chapter 2, it may suffice at this stage to say that a price increase of 4 cents represents 133% of a 3 cent ticket, 80% of a 5 cent ticket and 57% of a 7 cent ticket. There is some doubt as to the advisability of increasing prices to such an extent. However, if a cost rationalisation programme is implemented, the actual price increase necessary may in fact be considerably smaller.

If only operating costs are considered (R12 701,00), the price increase necessary to cover such costs amounts to approximately 1 cent per passenger. However, increasing prices by such a small amount may be somewhat inadvisable as it must be remembered that the cost structure is not stable. Hence allowance must be made for all forecasted cost escalations before any new fare price is set.

Table 2:4, showing profit/loss per passenger by day of the week, may be used to illustrate the fact that those days incurring the greatest absolute loss need not necessarily be the least efficient in an operational sense. The average operating loss incurred on Saturdays is 138% greater than that incurred on Sundays, yet the loss per passenger is 47% lower. Hence it must be appreciated before corrective action is applied that the potential response for each day will differ. Those representing the greatest potential are the 'exceptions' which should be considered first.

PROFIT/LOSS PER PERSON BY DAY OF THE WEEK

DAY	OPERATING LOSS	OPERATING PROFIT	AVERAGE NO. OF PASSENGERS PER DAY	LOSS PER PASSENGER	PROFIT PER PASSENGER
Monday	R 31,43		3 497	0,9 cents	
Tuesday	R 44,91		3 173	1,4 cents	
Wednesday	R 28,28		3 504	0,8 cents	
Thursday	R 24,93		3 585	0,7 cents	
Friday		R81,90	5 862		1,4 cents
Saturday	R138,38		2 046	6,8 cents	
Sunday	R 58,23		449	12,9 cents	
TOTAL	R326,16	R81,90	22 116	23,5 cents	1,4 cents

PROFIT/LOSS PER KILOMETRE BY DAY OF THE WEEK

DAY	OPERATING LOSS	OPERATING PROFIT	AVERAGE NO. OF KILOMETRES TRAVELLED	OPERATING LOSS PER KILOMETRE	OPERATING PROFIT PER KILOMETRE
Monday	R 31,43		1 005	3,1 cents	
Tuesday	R 44,91		1 005	4,5 cents	
Wednesday	R 28,28		1 005	2,8 cents	
Thursday	R 24,93		1 005	2,5 cents	
Friday		R81,90	1 005		8,2 cents
Saturday	R138,38		1 100	12,6 cents	
Sunday	R 58,23		605	9,6 cents	
TOTAL	R326,16	R81,90	6 730	35,1 cents	8,2 cents

4. Profit/Loss per kilometre

Given that the total distance covered by the transport service in 1975 was 350 000 kilometres and that the financial loss for the year was R47 000,00, loss per kilometre can be calculated at 13,4 cents. Whether such a loss can be eliminated through a reduction in the service, without severely disrupting commuters, is doubtful. On the other hand, if management considers only operating costs, the loss per kilometre is somewhat more reasonable at 3,6 cents. Again it is imperative that allowance be made for any forecasted cost escalation over the given period before any remedial action is applied.

While operating loss per kilometre is of general concern, it has two serious limitations, which arise from the fact that it is only concerned with the overall operating efficiency of the service. As such, it gives management no idea of operating loss per kilometre by day of the week, nor operating loss per kilometre according to routes travelled. Any corrective measures applied to the service in terms of general operating loss must be sub-optimal as they ignore the relative contribution made towards that loss by these specific sub-areas of operation. While passengers should be charged the same price for public transport every day of the week, this does not mean that they must receive the same service every day of the week. An analysis such as that given in Table 2:5 serves to indicate those days on which commuters are being overcatered for in terms of profitability. As with the analysis of operating loss per passenger, Table 2:5 illustrates clearly that the service provided on Saturday and Sunday is placing the greatest financial burden on the undertaking being considered.

Operating profit/loss according to routes travelled

An analysis of daily operating profit/loss per kilometre can be of far greater use when combined with an analysis of routes travelled by day of the week.

It is important that management not only be aware of daily operating efficiency, but also that it can determine the relative contribution towards that efficiency, or lack of it, by each of the routes over which the service operates.

The area required to be covered by the Grahamstown Municipal Bus Service is relatively small and hence there are only two basic routes followed by all buses.

Route A - This is a return trip, from the African township, of nine kilometres. In the majority of cases, this route caters for those commuters wishing to get to the Central Business District (C.B.D.) and its close surrounding areas. A charge of 5 cents is levied for a single trip.

Route B - This is a return trip, from the African township, of fifteen kilometres. It caters largely for the transport of commuters to the city's residential areas and academic institutions. A charge of 7 cents is levied for a single trip.

A further ticket of 3 cents is offered to school children who may, for this price, travel on either Route A or B.

Table 2:6 indicates, in terms of the timetabled service, how the average total distance covered each day of the week is distributed amongst Route A and Route B.

Table 2:6

DISTRIBUTION OF TOTAL DISTANCE TRAVELLED PER DAY ON ROUTES A AND B

DAY	NO. OF ROUTE A TRIPS	DISTANCE (KMS)	NO. OF ROUTE B TRIPS	DISTANCE (KMS)	TOTAL + DISTANCE
Monday/Friday	30	270	38	570	840
Saturday	30,5	275	44	660	935
Sunday	22	198	16	240	438
TOTAL	202,5	1 823	250	3 750	5 573

+ Note that the total distance given in Table 2:6 concerns only the timetabled service (290 000 kilometres per annum) ignoring private hire and special runs which constitute the further 60 000 kilometres per annum.

According to Table 2:6, Route A accounts for 32,7% and Route B for 67,3% of the total distance covered by the scheduled service. It is necessary, and not unreasonable, to assume that operating costs are divided in the same proportion. Total operating costs for this particular service, without regard to private hire and special runs, are in the region of R88 885,00 (290 000 kilometres at 30.65 cents per kilometre). In terms of the above analysis, the operating costs incurred by Route A are R29 065,00 (32,7%) and Route B R59 820,00 (67,3%).

In order to be able to calculate the profit or loss incurred by each route, it is necessary to determine their proportionate contribution to total revenue (Table 2:7).

Table 2:7

COMPOSITION OF TOTAL REVENUE BY DAY OF THE WEEK +

DAY	3 CENT TICKET CONTRIBUTION TO TOTAL REVENUE	7 CENT TICKET CONTRIBUTION TO TOTAL REVENUE	7 CENT TICKET CONTRIBUTION TO TOTAL REVENUE	TOTAL
Monday %	R 29,37 17	R 82,20 47,6	R 61,18 35,4	R 172,75 100
Tuesday %	R 25,71 12,3	R 71,40 46,9	R 62,16 40,8	R 159,27 100
Wednesday %	R 28,38 16,2	R 78,85 44,8	R 68,67 39	R 175,90 100
Thursday %	R 29,04 16,3	R 82,45 45,9	R 67,76 37,8	R 179,25 100
Friday %	R 52,74 18,5	R134,85 47,1	R 98,49 34,4	R 286,08 100
Saturday %	R 22,11 23,3	R 47,05 49,6	R 25,76 27,1	R 94,92 100
Sunday %	R 3,36 14,4	R 9,00 38,5	R 10,99 47,1	R 23,35 100
WEEKLY TOTAL (RANDS)	R190,71	R505,80	R395,01	R1 091,52

+ Derived from average daily revenue - Annexure B

Table 2:7 indicates that total revenue is accumulated by ticket category in the following proportions :

7 cent tickets - 36,2%
 5 cent tickets - 46,3%
 3 cent tickets - 17,5%

However, due to the fact that a 3 cent ticket may be used for either a Route A or Route B trip, and no record is kept by the undertaking to determine this fact, the contribution of such tickets to total revenue must be equally divided between the other two ticket categories. The final composition of total revenue by route is shown in Table 2:8.

Table 2:8

ADJUSTED DAILY COMPOSITION OF TOTAL REVENUE BY ROUTE

DAY	ROUTE A REVENUE	ROUTE B REVENUE	TOTAL
Monday	R 96,88	R 75,87	R 172,75
Tuesday	R 84,25	R 75,02	R 159,27
Wednesday	R 93,04	R 82,86	R 175,90
Thursday	R 96,97	R 82,28	R 179,25
Friday	R161,22	R124,86	R 286,08
Saturday	R 58,10	R 36,82	R 94,92
Sunday	R 10,68	R 12,67	R 23,35
TOTAL	R601,14	R490,38	R1 091,52

If weekly total revenue per route is used to calculate annual total revenue, it appears that Route A contributes R31 259,28 (55,1%) and Route B R25 499,76 (44,9%). The annual total revenue derived through this analysis is R56 759,00, which varies by 0,5% from that reflected in the undertaking's records (R57 068,00). Route B, however, has an additional revenue source in the form of season tickets, which may only be used on this route. Financial statistics indicate that the earnings from season tickets during 1975 were R11 988,00, making the revenue earned on Route B R37 488,00 and increasing its contribution towards total revenue to 66%.

A summary of the relationship between revenue and operating costs per route is given in Table 2:9.

Table 2:9

OPERATING PROFIT OR LOSS ACCORDING TO ROUTES TRAVELLED

ROUTE	OPERATING COST		TOTAL REVENUE		PROFIT	LOSS
A	R29 065,00	32,7%	R31 259,00	45,5%	R2 194,00	
B	R59 820,00	67,3%	R37 488,00	54,5%		R22 332,00
TOTAL	R88 885,00		R68 747,00		- R20 138,00	

It is clear, in terms of the above analysis, that Route B is largely responsible for the financial predicament of this service. While amassing R59 820,00 in operating costs, it only contributes R37 488,00 towards total revenue and the resulting loss (R22 332,00) cannot be fully internally subsidised by the operating profit earned on Route A (R2 194,00).

The appearance of a situation where the operation of one route alone causes the entire service to incur heavy annual losses can only occur where management is ignorant of how operating costs are apportioned among the various functional areas of the undertaking. Furthermore, it is also evident, in this case, that little attention has been paid to the real effect of both daily fluctuations in user demand and demand according to routes offered. The result of this inability to reconcile cost and revenue relationships with reference to specific operational parameters, is the setting up of, and the adherence to, a completely uneconomic timetable.

Certainly, there are several cases where non-viable timetables must be adhered to for the sake of the external economics and other benefits to be derived from efficient passenger transportation. However, management must face economic realities and distinguish between such acceptable cases and those where a timetable is followed in complete ignorance of its likely financial effect. It is generally held that action is seldom taken when the

result of that action is partially or completely unknown. It is, therefore, fundamental that the transport operator - as with any commercial or industrial undertaking - be aware of exactly where his revenue comes from and where his costs lie. By reconciling these two factors according to day, route and passenger, any service can work towards a cost minimising programme and be sure that, even if it is making a loss, this is to maintain or promote a social or economic benefit and not due to inefficiency.

It is common knowledge that no cost structure will remain constant over time and hence the importance of various functional areas, as cost centres, is in a continual state of flux. The rationalisation process must, therefore, be continuous in nature and must be directly related to monitored changes in the cost/revenue structure. The small transport service has, in this respect, a considerable advantage. Firstly, by virtue of its size, there exists a degree of flexibility which the large undertaking will find difficult to emulate. Secondly, the actual monitoring process will be easier, less time consuming and hence less costly than the identical operation performed within a large transport service. However, it still remains doubtful whether the small operator is in fact taking advantage of these natural benefits.

5. Cost/Revenue Rationalisation

A reduction in the quantity of service offered to commuters, by whatever name it may be called, (cut-back, rationalisation and so on) is usually associated with both a financially weak company and with certain resulting inconvenience to passengers who have become accustomed to a higher level of service which is essentially uneconomic. While the financial structure of the undertaking may be weak, the validity of complaints concerning commuter disruption is somewhat doubtful. As long as losses continue to rise the frequency and quality of maintenance and repairs will suffer, safety precautions may be ignored and staff apathy may arise - leading to further disruptions and inefficiencies.

It is debatable whether the level of service offered in such a case can, in real terms, be any better than a rationalised service which at least covers its operating costs and keeps yearly financial losses to a minimum. On the other hand, this reasoning does not apply if rationalisation means making drastic changes to the service level. In such a case, to avoid forced mass disruption to commuters, the operator must use the only alternative and increase prices. Thereafter, operating costs can be gradually brought into line with the new revenue structure.

The first step is, therefore, to determine the exact extent of changes needed to eliminate the operating loss incurred on any route, and what type of impact such changes would have on the commuter. This will give an indication of whether a cost solution alone will suffice or if alterations to the price structure are also necessary.

Table 2:10 shows the daily profit/loss incurred by the Grahamstown Municipal Bus Service on Route B. Weekly revenue from season tickets has been divided between each day in proportion to the value of ordinary tickets sold on that day, in order to gain a true reflection of the daily financial situation. While Table 2:10 illustrates well enough the extent of remedial action which must be taken each day, this type of solution is, of course, extremely impractical. Commuters have understandably come to expect a standardised frequency of service throughout the week, while weekends are treated as something separate. Thus while Saturday and Sunday can be given individual attention, it is necessary to determine the average reduction in service needed to eliminate any operating loss incurred from Monday to Friday.

It is unfortunately necessary, at this stage, to assume that any reduction in the service offered will have no effect on the existing revenue structure. The validity, or otherwise, of this assumption cannot be ascertained without a complete analysis of the revenue and demand structures, (Chapters 3 & 5),

ROUTE B OPERATING PROFIT/LOSS BY DAY OF THE WEEK

DAY	ROUTE B REVENUE	% OF TOTAL WEEKLY REVENUE	PROPORTION OF WEEKLY REVENUE FROM SEASON TICKETS	TOTAL REVENUE	DISTANCE COVERED (KMS)	OPERATING COST	PROFIT/LOSS
Monday	R 75,87	15,47	R 35,66	R 111,53	570	R 174,71	- R 63,18
Tuesday	R 75,02	15,3	R 35,27	R 110,29	570	R 174,71	- R 64,42
Wednesday	R 82,86	16,9	R 38,96	R 121,82	570	R 174,71	- R 52,89
Thursday	R 82,28	16,78	R 38,68	R 120,96	570	R 174,71	- R 53,75
Friday	R 124,86	25,46	R 58,70	R 183,56	570	R 174,71	+ R 8,85
Saturday	R 36,82	7,51	R 17,31	R 54,13	560	R 202,29	- R 148,16
Sunday	R 12,67	2,58	R 5,96	R 18,63	240	R 73,56	- R 54,93
WEEKLY TOTAL	R 490,38	100,00	R 230,54	R 720,92	3 750	R 1 149,40	- R 428,48
ANNUAL TOTAL	R25 449,76	-	R11 988,08	R37 487,84	195 000	R59 768,80	- R22 280,96

whereafter more realistic adjustments to the service can be suggested. Suffice it to say here that due to the fact that the average non-white commuter has very little option but to use the public transport service provided, a minimal change may be expected in the demand, and hence revenue pattern, as long as alterations made are kept within a certain limit. Obviously radical changes in the service must be expected to arouse some degree of commuter reaction. However, the determination of this threshold, above which alternatives should not be made, is extremely difficult. No commuter can be expected to reply in the affirmative when asked if he would accept even a minimal decrease in the service offered for the same price. Given the fact that commuter response to such a question may be unreliable, it is incumbent upon the undertaking to attempt to predict total passenger reaction from past experiences with service level alterations.

According to Table 2:10, the average total operating loss incurred from Monday to Friday is R225,39, or an average of R45,08 per day. In order to eliminate this loss, a reduction of 147 kilometres per day is necessary. This amounts to removing 9,8 trips (for practical purposes 10 trips) from the timetable on each of these days. The operating loss of R148,16 incurred on Saturdays necessitates a reduction of 483 kilometres, or 32 trips, while 179 kilometres or 12 trips, must be removed from the scheduled service on Sundays. These statistics and their effects, as correlated in Table 2:11, indicate that the degree of remedial action necessary to eliminate the present operating loss incurred on Route B, through cost manoeuvres only, is far too drastic to consider seriously. Undoubtedly some form of alteration to the price structure will have to be combined with fewer service reductions in order to reduce the loss to manageable proportions, without necessarily covering all operating costs. However, even at this point, it is patently clear that no viable combination of cost reduction and price increases will cover the operating loss incurred on Saturdays. Due to the fact that this day alone accumulates approximately 35% of the total weekly loss, harsh corrective measures must be implemented regardless of commuter reaction.

ROUTE B : COST RATIONALISATION BY DAY OF THE WEEK

DAY	OPERATING PROFIT/LOSS	NO. OF TRIPS REDUCED	KILOMETRES REDUCED	KILOMETRES REDUCED AS PERCENTAGE OF TOTAL KILOMETRES TRAVELLED	COST SAVINGS	PROFIT/LOSS
Monday	- R 63,18	10	150	26%	R 45,98	- R 17,20
Tuesday	- R 64,42	10	150	26%	R 45,98	- R 18,44
Wednesday	- R 52,89	10	150	26%	R 45,98	- R 6,91
Thursday	- R 53,75	10	150	26%	R 45,98	- R 7,77
Friday	+ R 8,85	10	150	26%	R 45,98	+ R 54,83
Saturday	- R 148,16	32	480	73%	R 147,12	- R 1,04
Sunday	- R 54,93	12	180	75%	R 55,17	+ R 0,24
WEEKLY TOTAL	- R 428,48	94	1 410	-	R 432,19	+ R 3,71
ANNUAL TOTAL	- R22 280,00	4 888	73 320	-	R22 473,88	+ R192,92

The above analysis has had as its aim the indication of the extent to which cut backs must be instituted in order to eliminate the entire operating loss incurred on Route B. There is, however, a far more feasible and practical alternative open to management. This second option involves allowing the operating profit earned on Route A and from private hire and special runs to subsidise Route B and thereafter institute measures to eliminate, or reduce any remaining operating loss.

According to Table 2:9, the operating profit earned on Route A in 1975 was R2 194,00. Private hire and special runs accounted for some 60 000 kilometres, (1) which at 30.65 cents per kilometre (2) implies a total operating cost of R18 390,00 for these two items. According to the service's records, the corresponding revenue earned was R25 921,00 (3), which results in an operating profit of some R7 531,00. The total amount of revenue available to offset the operating loss incurred on Route B is then R9 725,00.

Therefore, alterations to the level of service on this route must account for R12 556,00 per annum - the total operating loss for 1975. + The reductions necessary to eliminate this loss (given in Table 2:12) are somewhat more feasible than those necessary to make the route itself economically viable. While the average reduction of 10,5% during the week can by no means be considered excessive, it is still clear that the weekend service needs drastic remodeling to bring it more into line with proven daily passenger trends.

The decision as to whether the company should attempt to cover total operating costs or try to make each route viable in its own right, is by no means an easy one. In covering total operating costs only, there is the advantage that

(1) Refer Page 18

(2) Refer Page 18

(3) Refer Page 19

+ The operating loss derived through this analysis (R12 556,00) varies from that calculated on Page 24 (R12 701,00) by 1,1%. This is attributable to the unavoidably continuous use of averages in the preceding analysis.

ROUTE B : REQUIRED REDUCTION IN SERVICE TO ELIMINATE TOTAL OPERATING LOSS

DAY	OPERATING PROFIT/LOSS	REVENUE CONTRIBUTION BY ROUTE A PRIVATE HIRE AND SPECIAL RUNS	NET OPERATING PROFIT/LOSS	NO. OF TRIPS REDUCED	NO. OF KILOMETRES REDUCED	KILOMETRES REDUCED AS A PERCENTAGE OF TOTAL KILOMETRES TRAVELLED	COST SAVINGS	PROFIT/LOSS
Monday	- R 63,18	R 26,72	- R 36,46	4	60	10,5%	R 18,39	- R 18,07
Tuesday	- R 64,42	R 26,72	- R 37,70	4	60	10,5%	R 18,39	- R 19,31
Wednesday	- R 52,89	R 26,72	- R 26,17	4	60	10,5%	R 18,39	- R 7,78
Thursday	- R 53,75	R 26,72	- R 27,03	4	60	10,5%	R 18,39	- R 8,64
Friday	+ R 8,85	R 26,72	+ R 35,57	4	60	10,5%	R 18,39	+ R 53,96
Saturday	- R 148,16	R 26,72	- R 121,44	26	390	59,1%	R 119,54	- R 1,90
Sunday	- R 54,93	R 26,72	- R 28,21	6	90	37,5%	R 27,59	- R 0,62
WEEKLY TOTAL	- R 428,48	R 187,04	- R 241,44	52	780	-	R 239,08	- R 2,36
ANNUAL TOTAL	- R22 280,96	R9 726,08	- R12 554,88	2 704	40 560	-	R12 432,16	- R122,72

commuter disruption is minimised - a factor which will be carried over to the employers of such commuters. However, on the other hand, this approach means that there will be no annual contribution towards fixed costs and in fact, should future cost forecasts be correct, there is the possibility of further operating losses being incurred. Conversely, if management attempts to make each route financial viable, the monetary cushion of safety provided by profitable functions must be traded off against the resulting higher degree of passenger reaction.

CONCLUSIONS

This chapter has served to determine, with reference to specified parameters, the relationship between the costs of this particular transport service and the revenue it earns. As a result, management has some idea of the type and extent of corrective action which must be taken in order to increase financial viability.

The suggested effects of the rationalisation programme should be treated with some reserve. In the first instance, the effect on revenue through a decrease in the service level is ignored, and secondly, all costs have been assumed to be direct and perfectly flexible. It is nevertheless patently clear that Route B is not feasible as it stands. The reductions necessary to make this route theoretically viable are far too extreme and would undoubtedly have a strong adverse effect on demand and cause severe disruption to commuters and their employers.

While it is accepted that the continuation of transport facilities for the region served by this route is imperative, it is no less imperative that less costly operational procedures, which will still adequately provide for existing demand, be introduced as soon as possible.

CHAPTER 3

REVENUE STRUCTURE ANALYSIS

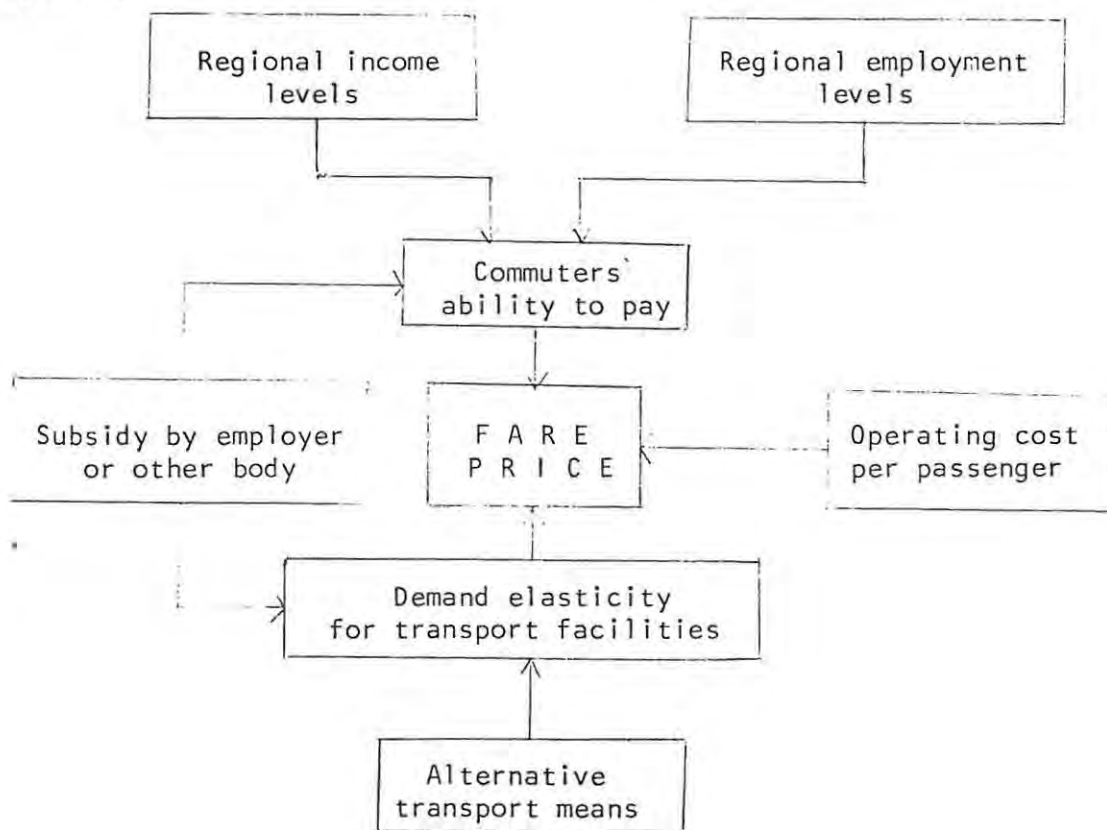
Revenue considerations, as far as public transport is concerned, are extremely difficult to approach objectively in that numerous ethical questions are posed and frequent value judgments necessitated. Furthermore, it is always those items which have a high repeat purchase rate that suffer from consumer criticism in the event of a price increase, and transport provides a more sensitive case in that it is not utilised purely for its own sake. The problems provided by these externalities and the question of consumer surplus undoubtedly serve to complicate and overcloud the issue.

There are, however, several basic parameters surrounding the revenue structure which management should attempt to quantify. Of paramount importance in this respect is the ability of commuters to meet their transport bill, especially in the case of the non-white. While the cost of providing a transport service for non-whites may be virtually the same as for whites, the potential revenue obtained from each is very different. Due to the relatively low absolute wages earned by non-whites, it would appear to be inequitable to expect them to expend a disproportionately high percentage of their income on transport. However, the determination of an 'equitable' percentage of income to be spent on transport is impossible, in practical terms, without some form of value judgment being made. Furthermore, this approach to pricing is only valid on the assumption that all transport users have an income and, therefore, its validity on an equity basis falls as employment percentages fall.

A further important revenue consideration is the existing elasticity of demand for the transport facilities. If this elasticity can be ascertained, management will be able to foresee the likely effect of future price changes.

Equity considerations aside, there are important differences here between white and non-white public transport systems. In general, the white commuter has an alternative to using public transport and for this reason alone demand elasticity is liable to be higher than for non-whites, who generally have little alternative. The obvious implication is that non-white transport fares can be increased without a relative fall off in passengers carried and hence without a resulting decrease in the external economics provided by that service. The problem with this approach is that it neglects the ethical consideration of the ability of the commuter to meet this increased fare. However, where the employer or some other body pays all or part of the commuter's fare, this ethical problem is overcome. In fact, because the employer receives part of the benefit of the service, it is equitable that he pay part of the cost. Diagram 3:1 models those parameters which should be considered when setting the level of fares.

Diagram 3:1



1. Regional employment levels

In attempting to relate the regional employment level to the ability of the commuter to pay a certain bus fare, it is obviously relative, and not absolute, employment levels that are important. For example, to justify a fare increase because the regional employment level is 80% will be fallacious if one year ago it was 90%. Also, an increase in the regional employment level will only serve to increase the number of commuters, which does not constitute a reason to increase fare prices unless accompanied by rising regional income levels.

2. Regional income levels

Here again importance must be attached to relative income levels such that an upward trend in real income will serve to increase the justification of a higher fare price.

3. Subsidies

When concerned with subsidisation, it is preferable, and possible, to work with absolute figures. This enables the calculation of the proportion of bus users who are subsidised and the extent to which that proportion is subsidised. As the degree of subsidisation of the commuter increases, so does the potential equitable fare.

4. Demand elasticity for transport facilities

Demand is itself partially determined by subsidies in that a person who is subsidised will not respond to a price increase by leaving the market, unless that subsidy is withdrawn or decreased. Therefore, the greater the degree of subsidisation, the more inelastic demand is likely to be. In practical terms, it is a simple matter to ascertain elasticity through an analysis of the effects which previous price changes have had on usage patterns. The more inelastic the demand, the greater will be the potential

fare price.

5. Operating cost per passenger

If subsidies are allowed for, then the operating cost per passenger will set a definite minimum below which prices cannot fall in order to ensure at least some annual revenue contribution towards fixed costs.

While contribution of all these factors is undoubtedly desirable in setting an equitable fare level, the inclusion of regional income and employment levels makes the ascertainment of an absolute price impossible. For example, if regional income and employment levels rise then there will be, on the average, an increased ability by the commuter to pay a higher fare. However, this fact does not rationalise itself with the commuter's ability to pay 11, 12 or 20 cents instead of 10 cents for a single ticket. Furthermore, the determination of reliable income and employment levels depends largely on the sampling methods used and the availability of information compiled by government departments. + It therefore, becomes necessary to find some more appropriate substitute for these two parameters - one which will give some concrete correlation between income and absolute fare prices. An analysis of this and other revenue related variables follows.

1. The commuters transport expenditure

The essence of a public transport undertaking is that it has a considerable degree of social conscience. Revenue maximisation must, at some point, cease to be of paramount importance and priority must be given to consideration for social welfare. Fares must be set at such a level that they cannot be

+ For example, the Bantu Affairs Administration Board in Grahamstown only began compiling employment records in 1974. This makes it impossible to find a correlation between employment levels and public transport useage.

accused of being excessive. The inevitable problem is, of course, defining in quantitative terms, the value of an "excessive" fare.

Table 3:1

SUGGESTED MONTHLY TRANSPORT EXPENDITURES AND THEIR RELATED PRIMARY HOUSEHOLD SUBSISTENCE LEVELS, (P.H.S.L.), AND HOUSEHOLD SUBSISTENCE LEVELS, (H.S.L.), FOR FIFTEEN SOUTH AFRICAN URBAN AREAS (7)

URBAN AREA	SUGGESTED TRANSPORT EXPENDITURE	P.H.S.L. & TRANSPORT EXPENDITURE	TRANSPORT EXPENDITURE AS % P.H.S.L. & TRANSPORT EXPENDITURE	H.S.L. +	TRANSPORT EXPENDITURE AS % H.S.L.
Cape Town	R 5,28	R 97,66	5,4%	R 108,93	4,9%
Port Elizabeth	R 3,90	R 100,03	3,9%	R 109,29	3,6%
Uitenhage	R 3,47	R 99,60	3,5%	R 107,59	3,2%
East London	R 4,50	R 97,33	4,6%	R 104,83	4,3%
Durban	R 5,43	R 100,68	5,4%	R 107,39	5,1%
Pretoria	R 6,22	R 102,77	6,0%	R 114,09	5,5%
Johannesburg	R 6,56	R 101,11	6,5%	R 111,21	5,9%
Bloemfontein	R 3,25	R 100,47	3,2%	R 109,57	3,0%
Benoni	R 4,55	R 99,10	4,6%	R 106,95	4,3%
Boksburg	R 4,76	R 99,31	4,8%	R 107,11	4,4%
Brakpan	R 3,90	R 98,45	4,0%	R 105,70	3,7%
Germiston	R 3,50	R 98,05	3,6%	R 104,30	3,4%
Springs	R 3,25	R 97,80	3,3%	R 103,80	3,1%
Krugersdorp	R 4,77	R 99,32	4,8%	R 105,92	4,5%
Vereeniging/ van der Byl Park	R 5,20	R 99,75	5,2%	R 108,25	4,8%
TOTAL	R68,54	R1 491,43	-	R1 614,93	-
AVERAGE	R 4,57	R 99,43	4,6%	R 107,66	4,2%

(1) Institute for Planning Research (University of Port Elizabeth) Fact Paper No. 12 1975 Derived from Table No. 32 Page 35

+ P.H.S.L. + Transport expenditure + rent = H.S.L.

Table 3:1 shows that proportion of the P.H.S.L., plus transport expenditures, and H.S.L. which should be spent on transport in a cross section of South African urban areas. By averaging these figures the author hopes to have arrived at an equitable proportion of the household's income to be spent on transport while realising that an overt value judgment has, perhaps necessarily, been made. Relating this information to the case in point, it can be stated that the fare structure enforced by the Grahamstown Municipal Bus Service should be set out at such a level that the average commuter expends no more than 4,2% - 4,6% of his monthly income on transport needs. +

2. DEMAND ELASTICITY FOR TRANSPORT FACILITIES

Before embarking on an elasticity analysis, it should be emphasised that at no point is the distance between anywhere in the Bantu townships and the centre of Grahamstown greater than 10 kilometres. This fact should tend to make the demand for transport facilities relatively elastic as a large portion of the town is within a walking distance of 1 - 3 kilometres from the nearest township.

The Grahamstown Municipal Bus Service has made only one change in the price of its fares since operations began in 1966. A price increase was made in December 1974 and was applied to the different ticket categories as follows :

2 cent tickets increased to 3 cents (School children)
 3 cent tickets increased to 5 cents (Route A)
 5 cent tickets increased to 7 cents (Route B)

The burden of the price increase, therefore, fell most heavily (with a 67% increase) on the major category of commuters, that is, those who use Route A. (1)

The following analysis of demand elasticity is conducted through a comparison of passenger and revenue figures for 12 months preceeding the price rise with the 12 preceeding months.

+ Income statistics are provided in Chapter 5

(1) Refer Page 20 - 23

1974 - 1975 : COMPARISON OF PASSENGERS CARRIED PER MONTH

MONTH	PASSENGERS CARRIED - 1974	PASSENGERS CARRIED - 1975	ABSOLUTE VARIANCE	PERCENTAGE VARIANCE
January	95 119	104 237	+ 9 118	+ 10%
February	94 611	99 377	+ 4 766	+ 5%
March	115 441	90 928	- 24 513	- 21%
April	111 448	95 642	- 15 805	- 14%
May	116 692	92 975	- 23 717	- 20%
June	98 513	94 065	- 4 466	- 5%
July	113 288	100 354	- 12 934	- 11%
August	110 405	91 875	- 18 530	- 17%
September	110 504	82 354	- 28 150	- 26%
October	111 536	106 447	- 5 089	- 5%
November	105 929	91 829	- 14 100	- 13%
December	100 215	93 796	- 6 419	- 6%
TOTAL	1 283 701	1 143 880	- 139 821	-
AVERAGE PER MONTH	106 975	95 323	- 11 652	-

1974 - 1975 : COMPARISON OF REVENUE EARNED PER MONTH

MONTH	REVENUE EARNED - 1974	REVENUE EARNED - 1975	ABSOLUTE VARIANCE	PERCENTAGE VARIANCE
January	R 4 055	R 5 801	+ R 1 746	+ 43%
February	R 4 635	R 6 668	+ R 2 033	+ 44%
March	R 5 032	R 6 024	+ R 992	+ 20%
April	R 4 264	R 7 138	+ R 2 874	+ 67%
May	R 5 092	R 6 038	+ R 946	+ 19%
June	R 3 984	R 5 914	+ R 1 930	+ 48%
July	R 5 382	R 7 102	+ R 1 720	+ 32%
August	R 4 695	R 6 139	+ R 1 444	+ 31%
September	R 4 694	R 6 789	+ R 2 095	+ 45%
October	R 5 064	R 6 616	+ R 1 552	+ 31%
November	R 4 245	R 5 856	+ R 1 661	+ 38%
December	R 5 510	R 6 197	+ R 687	+ 12%
TOTAL	R56 652	R76 282	+ R19 630	-
AVERAGE PER MONTH	R 4 721	R 6 357	+ R 1 636	-

Table 3:2 indicates that approximately 140 000 more passengers were carried in the 12 months before the price increase than in the following 12 months. This figure represents a reduction of some 10,89%. However, despite this substantial decrease in the number of commuters carried, Table 3:3 shows that revenue earned actually increased by R19 630,00 between 1974 and 1975. This figure amounts to 36% of the 1974 earnings or an increase of R55,00 per day.

To ensure that any elasticity calculated from Tables 3:2 and 3:3 is valid, it is important that allowance be made for any natural market increase in the number of commuters. According to records kept by the service, the natural market growth rate was 13,5% per annum, + which indicates that the real reduction in demand resulting from the price increase was 24,39%.

1. General Demand Elasticity

Elasticity at any point on the demand curve may be ascertained by using the following formula :

$$\frac{Q}{P} \times \frac{P}{Q}$$

Where:

Q = the change in quantity

P = the change in price

Q = the original quantity

P = the original price

In calculating general elasticity, P may be taken as the average original ticket price - 3.33 cents, and P as the average proportionate change in price - 52%, (1,67 cents).

+ Calculated from 1972 - 1974.

Demand elasticity in this case will be :

$$\frac{313\ 120}{1\ 67} \times \frac{3,33}{1\ 283\ 716}$$

$$= \underline{0,48} +$$

Despite the fact that a large proportion of the non-whites in Grahamstown have the option of walking (an option which cannot be considered too harsh in terms of their general living conditions), the demand for transport appears to be relatively unresponsive to price changes. There are four possible explanations which may account for this fact :

1. it is possible that the level of income in the region is sufficiently high to make transport expenditure insignificant. The results of research into income levels in Grahamstown would seem to refute this argument ; (1)
2. commuters may be heavily subsidised by employers and hence avoid the burden of the price increase ;
3. it is possible that the price changes were considered to be so small as to be of little consequence ; and
4. most probable, is the fact that transport may be viewed by the majority of commuters as an essential prerequisite to their carrying out their occupations. In this case the opportunity cost involved through boycotting the bus service is too great to consider seriously.

2. Elasticity by ticket category

Recognising that the present bus service covers two routes and that there are three levels of fare prices, some effort must be made to calculate elasticity by ticket category. (See Table 3:4 and Table 3:5)

+ Elasticity may vary from 0, which is perfectly inelastic, to infinity, which is perfectly elastic, at unity there is no net gain in total revenue if the price is increased

(1) Refer Pages 86 - 87

1974 - 1975 : PASSENGERS CARRIED BY TICKET PRICE

MONTH	1974 2 CENTS	1975 3 CENTS	1974 3 CENTS	1975 5 CENTS	1974 5 CENTS	1975 7 CENTS
January	22 304	38 111	48 825	41 579	23 990	24 547
February	19 243	31 124	48 854	41 053	26 521	27 200
March	27 364	28 549	55 926	40 192	32 150	22 187
April	32 774	32 875	47 904	41 922	30 770	20 845
May	34 590	28 062	51 258	40 979	30 844	23 934
June	26 611	28 641	40 701	43 044	30 201	22 380
July	28 861	29 178	49 856	44 789	34 571	26 387
August	28 437	28 263	49 369	40 859	32 598	22 753
September	30 799	21 888	41 764	38 026	37 941	22 440
October	29 145	28 127	46 599	53 016	35 802	25 304
November	27 336	26 564	48 574	42 862	30 019	22 403
December	31 082	25 952	42 741	49 389	26 392	18 455
TOTAL	339 546	347 334	572 371	517 710	371 799	278 835
AVERAGE VARIANCE	+ 7 788		- 54 661		- 92 964	



1974 - 1975 : REVENUE EARNED BY TICKET CATEGORY

MONTH	1974 2 CENTS	1975 3 CENTS	1974 3 CENTS	1975 5 CENTS	1974 5 CENTS	1975 7 CENTS
January	R 446,08	R 1 143,33	R 1 464,75	R 2 078,95	R 1 199,50	R 1 718,29
February	R 384,86	R 933,72	R 1 465,72	R 2 052,65	R 1 326,05	R 1 904,00
March	R 547,28	R 856,47	R 1 677,78	R 2 009,60	R 1 607,50	R 1 553,09
April	R 655,48	R 986,25	R 1 437,12	R 2 096,10	R 1 538,50	R 1 459,15
May	R 691,80	R 841,86	R 1 537,74	R 2 048,95	R 1 542,20	R 1 675,38
June	R 552,22	R 859,23	R 1 221,03	R 2 152,20	R 1 510,05	R 1 566,60
July	R 577,22	R 875,34	R 1 495,68	R 2 239,45	R 1 728,55	R 1 847,09
August	R 568,74	R 847,89	R 1 481,07	R 2 042,95	R 1 629,90	R 1 592,71
September	R 615,98	R 656,64	R 1 252,92	R 1 901,30	R 1 897,05	R 1 570,80
October	R 582,90	R 843,81	R 1 397,97	R 2 650,80	R 1 790,10	R 1 771,28
November	R 546,72	R 796,92	R 1 457,22	R 2 143,10	R 1 500,95	R 1 568,21
December	R 621,64	R 778,56	R 1 282,23	R 2 469,45	R 1 319,60	R 1 291,85
TOTAL	R6 790,92	R10 420,02	R17 171,13	R25 885,50	R18 589,95	R19 518,45
AVERAGE VARIANCE	R3 629,10		R8 714,37		R928,50	

Table 3:4 shows how the decline in passengers carried in 1975 over 1974 was split between the three different ticket categories.

Despite the fact that 140 000 fewer people were carried in 1975, the number of commuters travelling on 3 cent tickets actually increased by 7 788.

After allowing for the natural market growth rate of 13,5% on the 1974 total (45 838), there was a real decrease in the number of passengers carried of 38 050. Accordingly, the demand elasticity for this ticket category is :

$$\frac{38\ 050}{1} \times \frac{2}{339\ 546}$$

$$= \underline{0,22}$$

According to statistics of revenue earned per ticket category in Table 3:5, the raising of the ticket price from 2 cents to 3 cents resulted in a net revenue gain of some R3 629,10.

Table 3:4 indicates that the 3 cent to 5 cent price increase from 1974 to 1975 had a far greater impact on commuter demand than did the increase on the lower priced ticket. Of the 140 000 less people carried in 1975, 54 661 come from the 3/5 cent ticket category. Allowing for the natural market growth rate (77 270), the real decrease in passengers for this ticket category was 131 931 - a fall of some 23%. Demand elasticity for Route A is, therefore :

$$\frac{131\ 931}{2} \times \frac{3}{572\ 371}$$

$$= \underline{0,34}$$

Statistics of revenue earned in Table 3:5 show that, in spite of this 23% decrease in patronage, revenue earned from 1974 to 1975 increased by R8 714,37.

The raising of the fares on Route B from 5 cents to 7 cents has, according to Table 3:4, had a far greater effect on patronage than either of the two previous ticket categories. This price increase resulted in a decrease of

92 964 passengers which, added to the market growth rate of 13,5% (50 192) gives a total fall in patronage of 143 156, The demand elasticity of this ticket category is :

$$\frac{143,156}{2} \times \frac{5}{371,799}$$

$$= \underline{0,96}$$

According to Table 3:5, although 105 977 less passengers were carried in 1975, total revenue earned on this route increased by R928,50.

A comparison of revenue earned from the sale of tickets at the point of entry into the bus between 1974 and 1975, shows an increase of R13 271,97 of which R1 400,00 may be attributed to the natural market growth. (Given in Table 3:5 that total revenue for this item in 1974 was approximately R32 500,00)

Conclusions

In the case of public transportation, this type of analysis may be used in two ways as a tool to assist in pricing decisions.

1. It enables one to determine those routes where elasticity is approaching unity and thus upward adjustments to the price level can be withheld.
2. It facilitates a comparison of relative price elasticities. In this case a reliable indication of commuter reaction to price changes, within different ticket categories, may be derived. Priorities for future price increases can then be determined according to those categories which will give the maximum revenue while causing the minimum fall off in patronage.

Apart from ensuring greater profitability, this policy should, to a certain extent, counteract any potential loss of socioeconomic benefits to the region via the price mechanism.

In this particular instance, the elasticity analysis seems to indicate that changes in the demand for transport facilities are not related to relative

price changes, but rather to the absolute price charged. This is completely analogous with normal demand theory which states that the greater the proportionate price change, the greater will be the effect on quantity demanded. A possible explanation for this analogy is that in the case of a person with a very low absolute income, proportionate changes in price are liable to be of little consequence. If, after, a price increase, the absolute price is still low, demand patterns are unlikely to vary significantly. For items of a higher price, especially where purchase is of a greater repetitive nature, a price rise may have a marked effect on user demand. This argument, of course, is only valid on the assumption that both items possess, in the eyes of the user, the same degree of 'luxury' or 'necessity'. As a generalisation, it may be stated that non-whites, because of their economic position, cannot afford to treat public transport as a luxury. A transport service will tend to be used for necessary purposes such as the purchase of essential household goods or the maintenance of employment. Therefore, this assumption should, in the majority of cases, be valid.

As a general policy statement, it would appear to be true to say that the greatest proportionate price increases should be made on those routes which charge the lowest absolute prices. Such a course of action should, however, be qualified in each individual case according to the following factors :

1. The length of the route - the shorter the route, the more inequitable a relatively large price increase will be.
2. The number of stops on the route - the greater the number of stops, the more inequitable a general price increase will be, unless a staging policy is introduced. Those people disembarking soon after the commencement of the trip are in effect being discriminated against if they are charged the same price as those who follow the route to its destination.
3. The number of passengers using the route as a proportion of total patronage - if this proportion is small, the revenue implications of a price increase may be negligible.

3. The earnings profile

The study of the earnings profile is a vital part of any revenue analysis, in that initially it enables the delineation of the most profitable earning functions and thereafter provides a basis for forecasting the likely effects of any policy changes. The earnings profile of the Grahamstown Municipal Bus Service is given in Table 3:6.

Table 3:6

EARNINGS PROFILE 1972 - 1975

YEAR	TOTAL REVENUE	% CHANGE OVER PREVIOUS YEAR	INDEX
1972	R49 959,00	-	100
1973	R62 136,00	24%	124
1974	R72 175,00	16%	144
1975	R94 980,00	32%	190

As may be expected, due to the general inelasticity of demand for this service, the greatest annual increase in total revenue incurred during the year in which prices were increased. Assuming the revenue continues to grow at that average rate experienced before the price increase in 1975 and that no further price increases are enforced, a five year revenue forecast may be compiled as follows : +

Table 3:7

TOTAL REVENUE FORECAST 1976 - 1980

YEAR	EXPECTED INDEX	FORECASTED REVENUE
1976	212	R105 913,00
1977	234	R116 904,00
1978	256	R127 895,00
1979	278	R138 886,00
1980	310	R154 873,00

+ A linear progression is necessitated due to a partial or complete lack of records for that period prior to 1972.

Total revenue may accrue from three sources :

1. revenue from the sale of tickets at the point of entry into the bus (including revenue from the sale of 'season tickets') ;
2. revenue from private hire ; and
3. revenue from special runs.

The contribution of each of these revenue earning functions towards total revenue from 1972 - 1975 and their forecasted earnings for the proceeding five years is tabled below.

Table 3:8 A

REVENUE FROM SEASON TICKETS AND THE SALE
OF TICKETS AT THE POINT OF ENTRY INTO THE BUS
1972 - 1975

YEAR	REVENUE EARNED	% CHANGE OVER PREVIOUS YEAR	INDEX
1972	R41 870,00	-	100
1973	R50 419,00	20%	120
1974	R55 987,00	11%	134
1975	R69 056,00	23%	165

Table 3:8 B

FORECASTED REVENUE FROM SEASON TICKETS AND THE SALE
OF TICKETS AT THE POINT OF ENTRY INTO THE BUS
1976 - 1980

YEAR	EXPECTED INDEX	FORECASTED REVENUE
1976	182	R 76 203,00
1977	199	R 83 321,00
1978	216	R 90 439,00
1979	233	R 97 557,00
1980	250	R104 675,00

Table 3:9 A

REVENUE EARNED FROM PRIVATE HIRE 1972 - 1975

YEAR	REVENUE EARNED	% CHANGE OVER PREVIOUS YEAR	INDEX
1972	R 6 577,00	-	100
1973	R 9 309,00	42%	142
1974	R13 460,00	45%	205
1975	R16 429,00	29%	250

Table 3:9 B

FORECASTED REVENUE FROM PRIVATE HIRE 1976 - 1980 +

YEAR	EXPECTED INDEX	EXPECTED REVENUE
1976	300	R19 731,00
1977	350	R23 720,00
1978	400	R26 308,00
1979	450	R29 597,00
1980	500	R32 885,00

Table 3:10

REVENUE EARNED FROM SPECIAL RUNS 1972 - 1975

YEAR	REVENUE EARNED	% CHANGE OVER PREVIOUS YEAR	INDEX
1972	1 512	-	100
1973	2 408	59%	159
1974	2 728	13%	180
1975	9 495	248%	628

+ The index used in Table 3:9 B is based on the average increase in revenue from 1972 - 1975. No price changes have been instituted in this particular item.

Due to the fact that the value of special runs is directly related to the limited number of outlying business concerns that can make use of this service to transport their employees to and from work, it would be unreasonable to forecast future revenue on an index basis. The possibility of securing further contracts for special runs is completely unpredictable and hence the forecast should be limited to the 1975 figure of R9 495,00. This course of action necessitates the compilation of a more accurate total revenue forecast than that proposed in Table 3:7 which implies that revenue earned from special runs can be forecasted on an index basis.

Table 3:11

ADJUSTED TOTAL REVENUE FORECAST 1976 - 1980

YEAR	REVENUE FROM SALE OF TICKETS (1)	REVENUE FROM PRIVATE HIRE (2)	REVENUE FROM SPECIAL RUNS	TOTAL REVENUE
1976	R 76 203,00	R19 731,00	R9 495,00	R105 429,00
1977	R 83 321,00	R23 720,00	R9 495,00	R116 536,00
1978	R 90 439,00	R26 308,00	R9 495,00	R126 242,00
1979	R 97 557,00	R29 597,00	R9 495,00	R136 649,00
1980	R104 675,00	R32 885,00	R9 495,00	R147 055,00

The above breakdown of forecasted earnings into constituent earnings categories facilitates the ascertainment of priorities for future corporate action. Such action will naturally start with the major earnings category with a view to ensuring that monies from this source maintain a steady growth rate. (In this case, season tickets and the sale of tickets at the point of entry into the bus) In the second instance, those categories which are becoming of increasing importance are highlighted and subsequently policies to ensure their continued development can be instituted. (In this case the private hire category)

(1) Refer Table 3:8 B Page 57

(2) Refer Table 3:9 B Page 58

Finally, any grossly weak earner can be analysed with a view to possible rejuvenation, asset stripping or removal from the system.

CONCLUSION

Ultimately management will be faced with a revenue and cost forecast, both of which will have to be manipulated, within a framework of social consciousness, to ensure that the undertaking achieves a satisfactory future financial status. It must be accepted that, due to the very nature of public transport, the policies activated to minimise any existing or predicted profit gap will be highly subjective. However, without having an objective base from which to work, the effect of subjective decisions cannot be accurately determined, and hence the opportunity cost will remain unknown. This chapter has outlined those revenue factors which must be analysed if an optimal, or near optimal pricing policy is to be pursued.

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COST STRUCTURE ANALYSIS

A cost analysis is, by nature, a purely objective exercise and as such it is traditionally conducted within the framework of the following factors :

1. identification and analysis of existing cost centres ;
2. analysis of the relationship between operating and fixed costs ; and
3. analysis of cost escalation in general and within defined cost centres.

1. IDENTIFYING COST CENTRES

The delineation of cost centres is of fundamental importance as attempted savings in periferal cost areas will naturally have minimal results. Tables 4:1 - 4:4 indicate clearly the functional areas within which the major cost centres of the Grahamstown Municipal Bus Service lie. + These are :

1. wages and salaries ;
2. maintenance and repairs on buses ; and
3. petrol, oil, grease and tyres.

From 1972 to 1975 these three items represented an average of 89% of total operating costs. However, using actual cost figures has resulted in an unavoidable inconsistency in that the item 'petrol, oil, grease and tyres' appears for the first time in the 1974 accounts. Formerly this items was reflected in several other municipal accounts and was not attributed to the bus service itself. Such action was evidently taken to allow the service to find its feet financially during its first years of operation. However, this has resulted in a distortion of both the actual size of total variable costs,

+ The variable costs shown in Tables 4:1 - 4:4 have been categorised on the same basis as those presented in Table 2:1 (refer page 16), where variable cost is essentially a pure operating cost.

COST STRUCTURE 1972

ITEM	VARIABLE COST	VARIABLE COST AS % OF TOTAL VARIABLE COST	VARIABLE COST AS % OF TOTAL COST	FIXED COST	FIXED COST AS % OF TOTAL FIXED COST	FIXED COST AS % OF TOTAL COST	TOTAL COST
Wages & Salaries	R16 050,00	39%	30%				R16 050,00
Uniforms	R 128,00	-	-				R 128,00
Advertising, Printing and Stationery	R 2 026,00	5%	4%				R 2 026,00
Electricity & Water				R 462,00	4%	1%	R 462,00
Establishment Charges				R 1 000,00	8%	2%	R 1 000,00
Administration (Non European Affairs Department)				R 50,00	-	-	R 50,00
Administration (City Works Department)				R 120,00	1%	-	R 120,00
Insurance	R 1 352,00	3%	2%				R 1 352,00
Repairs Fund Contribution (i) Buses (ii) Buildings				R 400,00 R 100,00	1% 1%	1% -	R 400,00 R 100,00
Maintenance & Repairs (i) Buses (ii) Buildings	R18 980,00	47%	36%	R 85,00	1%	-	R18 980,00 R 85,00
Loan Charges (i) Interest (ii) Redemption				R10 396,00	82%	19%	R10 396,00
Equipment	R 2 053,00	5%	4%				R 2 053,00
TOTAL	R40 589,00			R12 613,00			R53 202,00

COST STRUCTURE 1973

ITEM	VARIABLE COST	VARIABLE COST AS % OF TOTAL VARIABLE COST	VARIABLE COST AS % OF TOTAL COST	FIXED COST	FIXED COST AS % OF TOTAL FIXED COST	FIXED COST AS % OF TOTAL COST	TOTAL COST
Wages & Salaries	R19 845,00	43%	33%				R19 845,00
Uniforms	R 300,00	-	-				R 300,00
Advertising, Printing and Stationery	R 881,00	2%	1%				R 881,00
Electricity & Water				R 375,00	3%	1%	R 375,00
Establishment Charges				R 1 000,00	7%	2%	R 1 000,00
Administration (City Works Department)				R 120,00	-	-	R 120,00
Insurance	R 3 140,00	7%	5%				R 3 140,00
Repairs Fund Contribution (i) Buses (ii) Buildings				R 400,00 R 100,00	3% -	- -	R 400,00 R 100,00
Maintenance & Repairs (i) Buses (ii) Buildings	R20 817,00	46%	34%	R 46,00	-	-	R20 817,00 R 46,00
Loan Charges (i) Interest (ii) Redemption				R13 220,00	87%	22%	R13 220,00
Equipment	R 616,00	1%	1%				R 616,00
TOTAL	R45 599,00			R15 261,00			R60 860,00

COST STRUCTURE 1974

ITEM	VARIABLE COST	VARIABLE COST AS % OF TOTAL VARIABLE COST	VARIABLE COST AS % OF TOTAL COST	FIXED COST	FIXED COST AS % OF TOTAL FIXED COST	FIXED COST AS % OF TOTAL COST	TOTAL COST
Wages & Salaries	R28 912,00	43%	27%				R28 912,00
Uniforms							
Advertising, Printing and Stationery	R 1 191,00	1%	1%				R 1 191,00
Electricity & Water				R 542,00	3%	-	R 542,00
Establishment Charges				R 1 000,00	5%	1%	R 1 000,00
Administration (City Works Department)				R 120,00	-	-	R 120,00
Insurance	R 3 389,00	4%	3%				R 3 389,00
Petrol, Oil, Grease and Tyres +	R21 105,00	24%	19%				R21 105,00
Repairs Fund Contribution (i) Buses (ii) Buildings				R 400,00 R 100,00	2% 1%	- -	R 400,00 R 100,00
Maintenance & Repairs (i) Buses (ii) Buildings	R32 424,00	36%	30%	R 272,00	1%	-	R32 424,00 R 272,00
Loan Charges (i) Interest (ii) Redemption				R16 938,00	87%	16%	R16 938,00
Equipment	R 2 197,00	2%	2%				R 2 197,00
TOTAL	R82 218,00			R19 372,00			R108 590,00

+ Prior to 1974 this cost was absorbed by the Municipality itself.

COST STRUCTURE 9175

ITEM	VARIABLE COST	VARIABLE COST AS % OF TOTAL VARIABLE COST	VARIABLE COST AS % OF TOTAL COST	FIXED COST	FIXED COST AS % OF TOTAL FIXED COST	FIXED COST AS % OF TOTAL COST	TOTAL COST
Wages & Salaries	R 38 021,00	35%	27%				R 38 021,00
Uniforms							
Advertising, Printing and Stationery	R 406,00	-	-				R 406,00
Electricity & Water				R 355,00	1%	-	R 355,00
Establishment Charges				R 500,00	1%	-	R 500,00
Administration (City Works Department)				R 720,00	2%	1%	R 720,00
Insurance	R 6 278,00	6%	4%				R 6 278,00
Petrol, Oil, Grease and Tyres	R 29 505,00	27%	21%				R 29 505,00
Repairs Fund Contribution (i) Buses (ii) Buildings							
Maintenance & Repairs (i) Buses (ii) Buildings	R 29 385,00	27%	21%	R 569,00	2%	-	R 29 385,00 R 569,00
Loan Charges (i) Interest (ii) Redemption				R 5 943,00 R26 365,00	17% 77%	4% 19%	R 5 943,00 R 26 365,00
Equipment	R 2 519,00	2%	2%				R 2 519,00
Postage & Telephone	R 255,00	-	-				R 255,00
Materials & Stores	R 925,00	1%	-				R 925,00
TOTAL	R107 294,00			R34 452,00			R141 746,00

and the proportion / 66.

and the proportion of such costs attributed to other cost centres during 1972 and 1973. In order to correct this deficiency, an amount equal to the average proportion of total variable costs spent on this item during 1974 and 1975 (25%) must be added to the 1972 and 1973 figures. The implications of this action on the cost structure and other cost centres are as follows :

1972

Petrol, oil, grease and tyres (at 25% of total variable cost) - R9 741,00

Total variable costs - R50 330,00

Total costs - R62 943,00

Wages and salaries as a proportion of total variable cost - 32%

Maintenance and repairs as a proportion of total variable cost - 38%

1973

Petrol, oil, grease and tyres (at 25% of total variable cost) - R10 944,00

Total variable costs - R56 543,00

Total costs - R71 804,00

Wages and salaries as a proportion of total variable cost - 35%

Maintenance and repairs as a proportion of total variable cost - 37%

After having adjusted these two annual cost structures, the three major cost centres in reality comprised an average of 93% of total variable costs from 1972 to 1975. This fact gives a reliable indication of the amount of effort which should be expended on the management and control of these areas.

Unfortunately, from an operational viewpoint, cost control cannot be subjected to any meaningful scrutiny as company size, company policy and proven methods and procedures pertinent to the situation within each company and its operating environment, must play a dominant role. Thus only general policy statements can be made in an attempt to highlight those aspects of cost management which should be continually evaluated.

1. Wages and salaries

This item constitutes an average of 34% of total operating costs. Cost savings in this area tend to be difficult to attain as the undertaking requires almost no unskilled labour. Finding Black drivers with the specific licence requirements to perform this duty is no easy matter and hence the laws of supply and demand necessitate a certain minimum wage. Furthermore, greatest consideration must be given to the safety of every passenger and thus selection of what drivers are available is undertaken with utmost care. In order to obtain the best, a high wage must be offered.

In recognition of the fact that drivers' wages represent the major portion of this cost category, some controls must be instituted to ensure that their remuneration is in some way commensurate with the productivity achieved.

For example :

- a) keeping records of the frequency of complaints received, including speeding offences and overloading, and analysing how these are distributed amongst the drivers ; and
- b) giving each driver his own bus and analysing the frequency and cost of maintenance and repairs in relation to other buses of a similar age.

Those drivers who perform poorly on the selected criteria could either be discharged or be faced to accept a lower pay packet as proof exists of their relative incompetency.

Workshop personnel must similarly be evaluated in terms of the quality of maintenance and repairs and in terms of some type of control ratio :

$$1. \text{ Efficiency ratio} = \frac{\text{allowed hours}}{\text{actual hours worked}}$$

and / or

$$2. \text{ Capacity ratio} = \frac{\text{actual hours worked}}{\text{budgeted hours}}$$

and / or

$$3. \text{ Activity ratio} = \frac{\text{allowed hours}}{\text{budgeted hours}}$$

2. Petrol, oil, grease and tyres

This item comprises approximately 25% of total operating costs, with petrol being the largest single component of the cost centre.

October 1973 saw the bursting of the bubble as far as the worlds oil supply was concerned, and the resulting price increases played a large part in the general upswing in public transport operating costs. This is substantiated by the fact that the cost of petrol, oil, grease and tyres to the Grahamstown Service nearly doubled, with an increase of 93%, between 1973 and 1974. (1) Cost savings in this particular centre will, therefore, be particularly difficult to achieve.

The cost of fuel is largely determined by the level of service offered and thus, being a dependent variable, it can only be altered through an implementation of a change in the service level. For any given service level, fuel cost will be determined, ceteris paribus, by changes in the price of petrol.

3. Maintenance and repairs

This item comprises some 32% of total operating costs. Due to the fact that passenger safety is of utmost importance and that the cost of spare parts is continually rising, this cost centre possesses a certain degree of inflexibility. However, a breakdown of the frequency of specific repairs can point to some opportunities for the undertaking to reduce costs by enabling :

- a) the pre-planning of ordering spare parts ;
- b) the scheduling of work items and facilities for repair ;
- c) the prevention of costly repairs caused by waiting for a breakdown to occur ; and/or
- d) the eradication of erratic work flows.

(1) Refer Tables 4:2 and 4:3 Page 63 - 64

Table 4:5

GRAHAMSTOWN BUS SERVICE MAINTENANCE AND REPAIR ITEMS1-1-1973 - 31-4-1976

ITEM	FREQUENCY OF REPAIR ITEM	AVERAGE FREQUENCY OF REPAIR ITEM PER ANNUM	REPAIR ITEM AS % OF TOTAL REPAIRS
Speedometer	80	24	22%
Clutch	49	15	14%
Pressure Plates	43	13	12%
Gearbox	41	12	11%
Engine	39	12	11%
Breaks	30	9	8%
Differential	18	6	5%
Starter Motor	14	4	4%
Axles	7	2	2%
Fuel Pump	7	2	2%
Body Repairs	7	2	2%
Alternator/Generator	6	2	2%
Exhaust System	4	1	1%
Drive Shaft	4	1	1%
Springs/Suspension	3	1	1%
Fuel Tank	2	1	1%
Lights	2	1	1%
TOTAL	356	-	100%

Preventive maintenance on those breakdowns which occur more frequently can then be intelligently organised.

Bus speedometer cables are unusually long and due to this fact are susceptible to frequent malfunctions. Repairs are unpredictable and cost more from the point of view of time than spare parts. However, this cost is unavoidable if an accurate record of fuel consumption and kilometres covered is maintained, and if the driver is to be able to adhere to safe speeds.

An inherent feature of public transport is the large number of stop/starts necessitated over a relatively short distance. This has the effect of causing an increased amount of wear and tear on certain of the buses' moving parts, especially clutch, pressure plate, gearbox and brakes. Maintenance and repairs, therefore, are not only related to the distance covered by the bus, but also to the number of bus stops within any one route. An opportunity for the reduction of these costs presents itself in the form of ensuring that every bus stop is essentially, or at least consistent with the minimum requirements of the area. Due to the highly repetitive nature of the service, this policy could produce substantial tangible benefits.

In general terms those factors which play an important role in determining the level of maintenance and repair costs are :

1. the age of the bus ;
2. the quality of the bus ;
3. the quality of the bus driver ;
4. the topographical conditions of the area serviced ;
5. traffic congestion ; and
6. the quality of workshop personnel.

It is apparent that of all these factors the age of the bus is possibly the most important. As a vehicle gets older, the cost of maintaining and repairing it increases, until a stage is reached where the costs become exorbitant. Due to the fact that a bus in this predicament has already been written off, the operator may be under the misconception that it is costing him nothing. In reality, with the productivity of the bus continually falling and its operating costs increasing, it may no longer be economical to continue using it. In South Africa the average age of buses is between 7 and 8 years, whereas it is common practice in Europe to scrap a bus at this age, giving an average fleet age of 4 to 5 years. (1) The average age of buses in the Grahamstown service is just below the South African average at 6 years.

(1) VERBURGH C, WELGEMOED P J AND CILLIERS H F I : op cit Page 105

The combined effect of the abovementioned factors could possibly lead to a doubling of maintenance and repair costs. Although the operator does not always have control over these factors, it is important that he realises their potential and can, therefore, guard against possible inefficiencies.

2. THE RELATIONSHIP BETWEEN OPERATING, FIXED AND TOTAL COSTS

In theoretical terms any undertaking with liquidity problems should attempt to keep its fixed costs as low as possible due to the fact that this course of action minimises the break even volume. As most public transport concerns find themselves in a continual liquidity squeeze they should, accordingly, keep a close watch on the relationship between variable and fixed costs. However, in practical terms there is a definite limit below which fixed costs cannot fall without severely affecting the operation. Unfortunately, this level is impossible to determine. It is also probable that only major shifts in the composition of total costs can in fact have any appreciable effects on the break even volume.

The relationship between operating and fixed costs for the Grahamstown Municipal Bus Service is given in Table 4:6.

Table 4:6

THE RELATIONSHIP BETWEEN OPERATING, FIXED AND TOTAL COSTS FOR THE GRAHAMSTOWN MUNICIPAL BUS SERVICE 1972 - 1975

YEAR	OPERATING COSTS AS % OF TOTAL COST	FIXED COSTS AS % OF TOTAL COST
1972	80%	20%
1973	79%	21%
1974	82%	18%
1975	76%	24%
AVERAGE	79%	21%

3. COST ESCALATION

A forecast of cost escalation often tends to have far fewer benefits, and is indeed often less reliable, than a similar revenue analysis. In the first instance, many costs incurred by transport undertakings are completely beyond its control (for example, fuel or spare parts) and hence the size of any single cost function may be determined largely by exogenous factors. Secondly, if there is a continual struggle to improve efficiency, management is likely to discover new methods and procedures which will lead to better cost effectiveness. Hence any forecast made prior to such a discovery will necessarily be inaccurate. Under such conditions a forecast of escalation within specified cost centres would be of little practical benefit. For this reason, the following analysis of cost escalation concerns only the total cost trend indicated for the future should the service do nothing to alter its present operational procedures. The analysis is furthermore conducted on the assumption that the cost of purchases to the undertaking will increase at the average rate experienced over the past four years.

Table 4:7 A

TOTAL COST PROFILE 1972 - 1975

YEAR	TOTAL COST	% CHANGE OVER PREVIOUS YEAR	INDEX
1972	R 62 943,00	-	100
1973	R 71 804,00	14%	114
1974	R108 590,00	51%	172
1975	R141 746,00	31%	225

Table 4:7 B

TOTAL COST FORECAST 1976 - 1980

YEAR	EXPECTED INDEX	FORECASTED COST
1976	267	R168 058,00
1977	309	R194 493,00
1978	351	R220 929,00
1979	393	R247 366,00
1980	435	R273 802,00

CONCLUSIONS

Public transportation is characterised to a certain extent by a naturally inflexible revenue structure. Due to the many moral and ethical questions surrounding any particular pricing policy, it is normal, and indeed advisable, for any public transport concern to pay particular attention to its cost structure. This suggestion, however, is too often construed as meaning that costs must always be minimised with the result that a poor, unsafe and ultimately more costly service is achieved. It is, therefore, essential that any potential cost reduction be analysed within a given framework of earning power and not as an isolated entity.

This chapter has outlined those cost factors which must come under constant surveillance in order that any unwarranted upward movement can be promptly and intelligently dealt with.

CHAPTER 5

SOCIAL IMPACT OF THE TRANSPORT SYSTEM

According to modern business logic the consumer is the natural starting point in the development and marketing of any successful good or service. Public transport can by no means be excluded from this principle. A survey, in the form of a questionnaire, was therefore conducted to determine, inter alia, local attitudes towards both the quantitative and qualitative aspects of the Grahamstown Municipal Bus Service. + Respondents were divided into two general categories according to which of the two routes offered by the service effected them. This approach enables a segmentation of the total market and hence the determination of specific problems by route offered. The results of the questionnaire were as follows :

Question 1

"Do you employ any Bantu labour, whether part time or full time?"

A) Residential area (Route B)

According to the sample taken, 94% of the residential households in Grahamstown employ some form of domestic labour. This relatively high proportion can be largely attributed to the fact that the large pool of unemployed Black labour in this region has forced wages down to a level which most households can afford.

B) Central Business District (Route A)

98% of the commercial and industrial respondents within this category confirmed that they employed some form of Black labour.

+ For details of the sampling method used, the format of the questionnaire and the number of people making various alternative responses to each question, see Annexure A

Question 2

"Does he/she/they reside on the premises?"

A) Residential area

Of the total number of domestic employees, 10% were actually resident on the premises while the remaining 90% relied on some form of transport in order to get to their place of employment. The results of this question give an indication of the extreme importance of the local transport service in terms of the Black's ability to procure and maintain domestic employment.

Question 3

"If any employee does reside on the premises, how often does he/she/they leave the premises on days off? How does he/she/they travel?"

A) Residential area

The purpose of this question was to ascertain the importance of the bus service to those 10% of domestic employees who were resident on the employer's premises. In total, however, they represented a bus usage rate of only 36 times per month and hence were disregarded as an inconsequential minority.

Question 4

"If any employee does not reside on the premises, how does he/she/they get to work?"

A) Residential area

Of the non-resident employees outside the C.B.D., 93% relied on the local bus service in order to reach their place of employment. Relating this figure to the total number of Black employees in the residential

area, 84% of such total travel to and from work using the transport service provided by the Municipality.

B) Central Business District

The information received from employees in the commercial sector tended to follow the same pattern as that of domestic employees, in that 87% used the bus service to get to and from their place of employment.

The information received from this question indicates, as may be expected, a heavy reliance by non-whites on public transport, which, in all likelihood, is due largely to a lack of alternative transport means. This high degree of dependence, however, serves the fundamental function of illustrating the profound social impact associated with the transport operator's pricing policy.

Question 5

"If any employee uses the bus service to get to work, is the fare paid by you, by him/her/them or partly by you and partly by him/her/them?"

The object of this question was to determine the extent to which price inelasticity may be attributed to the fact that the burden of the fare falls mainly on the employer and not the employee. The greater the degree of subsidisation by employers, the more feasible a price increase will be in order to improve the revenue structure.

A) Residential area

In the domestic sector, 31% of employers stated that they paid the complete bus fare for their employees. A further 8% indicated that they occasionally contribute 'something' towards fares or paid a monthly amount which was nevertheless insufficient to cover the total transport

bill. 61% of employers, therefore, contributed nothing towards their employees bus fares and hence this cost came directly out of the workers' pocket.

B) Central Business District

The survey of commercial employers brought results which were somewhat different from those of the residential area. Only 9% of employers paid for their employees bus fares with 2% contributing a portion of such fares. Most employers took the view that travelling to and from work was a cost universally incurred by employees and saw no reason for this situation to be changed. Employees, they stated, should be paid according to productivity and length of service, and not according to their individual predicaments. This was in direct contrast to the domestic employer, who frequently has a more informal relationship with his/her employee, and who is thus more receptive to the employee's personal problems. It was not unexpected, therefore, that a greater proportion of employers of domestic labour paid the transport costs of their employees.

The general response to this question indicated that price increases could not be made on the grounds that the average Black employee would avoid the resulting extra tariff burden. While a price increase may be more feasible on Route B, with a 31% subsidy rate (residential area), it would undoubtedly be more equitable to relate prices to the average income earned in each sample area.

Question 6

"If you (the employer) pay your employees' transport bill, do you feel the present rates are too low, tolerable or too high?"

A) Residential area

In this section of the sample, 8% of the respondents were of the opinion that present tariffs were too low, 88% believed they were tolerable and only 4% claimed they were too high. Those who thought that present tariffs were too low had all had past experience with bus transport in other areas of the country where, they claimed, fares were incomparably higher than those of the local operation.

B) Central Business District

Those commercial employers concerned were all of the opinion that the present level of bus fares was tolerable. However, this sample was too small for any meaningful statistical analysis.

Question 7

"If you (the employer) pay your employees' bus fare, would you still be prepared (or feel obliged) to do so if fares were increased by (i) 50% (ii) 100%?"

A) Residential area

This question provided some interesting results in that the majority of those respondents who best described the present fares as 'tolerable' (Question 6), indicated that they would be prepared to tolerate much higher fares. 92% of respondents in this category stated that they would fully subsidise their employees in the event of both a 50% and 100% increase in prices. Most were of the opinion that a large proportionate increase in fare prices would amount to a very small real increase in outlay. This figure, however, represents only 22% of the total sample taken of residential employers.

B) Central Business District

In the commercial area, all respondents who pay their employees' bus fares agreed that they would be prepared to pay the increased prices.

Question 8

"If you (the employer) do not pay your employees' bus fare would you be prepared (or feel obliged) to increase your employees wage by the full or some proportionate amount of a fare increase of (i) 50% (ii) 100%?"

This question was posed in order to determine the likely response to a price increase of those employers who did not contribute a separate amount towards their employees' transport bill. If such people were willing to increase their employees wages, they would in effect be paying the costs of transport and would, therefore, be incurring the burden of a price increase themselves.

A) Residential area

61% of respondents indicated that they would be prepared to carry the burden of a 50% increase in prices and 57% would pay for a 100% increase. In terms of the total sample of 100 employers, these figures represent 33% and 31% respectively.

B) Central Business District

Respondents from the C.B.D. were generally very adamant that wages should not be altered for reasons unrelated to the work situation. Of those employers who contributed nothing towards their employees' transport costs, only 16% indicated that they would be prepared to subsidise their employees transport bill via the wage mechanism. Even this, many admitted was showing unwarranted leniency on the grounds of sympathy. This feeling was in fact reflected by most respondents (in both sample areas) who agreed to carry the transport burden.

Through combining the responses to Questions 7 and 8, the total extent of subsidisation of employees in each sample area, may be expressed as follows :

Residential area

- (i) Proportion of employers prepared to carry an extra 50% transport bill = 55%
- (ii) Proportion of employers prepared to carry an extra 100% transport bill = 53%

Central Business District

- (i) Proportion of employers prepared to carry an extra 50% and 100% transport bill = 20%

Whether extensive price changes can be made on the basis of these results is doubtful. Firstly, with the elasticity of demand on this route approaching unity, (1) it is inconceivable that over 50% of all commuters are being subsidised by their employers. This situation seems to cast doubt on the validity of the responses of several employers in this area. In the second instance, assuming employer responses to be true, a price increase may be discriminating against those who are not subsidised by forcing them to spend an 'inequitably high' proportion of their monthly income on transportation.

Question 9

"Do your employees travel on season tickets?"

The object of this question was to determine how many commuters take advantage of purchasing tickets in series of ten, for which a discount of 10% is given. (The offer of season tickets applies only to Route B - that covering the residential areas.) The advantage of this system, apart from the obvious financial advantage to the commuter, is that no money changes hands on entry into a bus and hence there is a speeding up in loading time.

(1) Refer Pages 53 - 54

Furthermore, the driver/conductor is not tempted to steal by taking ticket money and not issuing tickets.

The response to this question indicated that 81% of commuters paid for their ticket at the point of entry into the bus. Therefore, only 19% purchased season tickets and the majority of this number were employees who's employers covered the full cost of their transport. Most commuters buying tickets daily indicated that they did this because season tickets were only sold at the municipal offices which were generally out of their way.

In the light of responses to this question, it would appear that both the bus service and commuters are incurring disadvantages due to the lack of availability of season tickets. Firstly, several incidents of theft by drivers have been reported. This type of situation could be drastically reduced should commuters purchase tickets before they enter the bus, whether these be season tickets or not. Secondly, non-whites tend to be price conscious and would undoubtedly respond favourably should season tickets be made more easily available to them.

Question 10

"Do you, the employer, feel that the quality of the bus service is good, indifferent, poor or don't you know?"

The object of this question was to ascertain how aware employers are of the problems their employees encounter with the bus service and the extent to which any deficiencies in the service affect employers themselves.

A) Residential area

In residential areas the majority of respondents (65%) were of the opinion that the quality of the bus service was indifferent, while 7% thought it was good and 12% poor. 16% admitted they had no idea how good or bad it was.

B) Central Business District

In the second sample, the tendency for employers to be unaware of problems existing outside the business environment was again evident. 60% of employers were unable to comment on the quality of the service, while 2% thought it was poor, 33% thought is indifferent and 5% good.

The response to this question indicates that general management has little to fear in the way of complaints by employers concerning the quality of the bus service. Within the C.B.D., employers could only be expected to complain if the service was adversely effecting their business operations, hence at this stage their ignorance of the quality of the service may be seen as being synonymous with their acceptance of such quality. In the residential area, even though employers are more au fait with the problems of their employees, only a small proportion found reason to criticise the service.

Question 11

"The following are some complaints lodged against the Grahamstown Municipal Bus Service, which of them apply to your employees?"

(Obtaining reliable replies to the following questions posed several problems. Firstly, only very occasionally did the employer feel qualified to comment on problems with the service which they had never personally experienced, although some were well aware of the complaints of their employees in this regard. In most cases, therefore, it was necessary to interview the employee himself which, in residential areas, often necessitated returning the next day during working hours. Due to the fact that permission to do this was refused by 9 respondents and because in some cases language presented a communications barrier, only 65 reliable respondents were found.)

In the C.B.D. sample, many employers were loathe to interrupt employees for the purpose of completing this question, and hence only 31 respondents were forthcoming. For this reason the two samples had to be combined.

(i) "Overcrowding"

Responses were as follows :

- A) Never - 2%
- B) Occasionally - 22%
- C) Frequently - 44%
- D) Always - 32%

Overcrowding was defined as more than one person per seat and eight persons standing, which is the legal limit for buses of the size used by the service.

The response obtained to this question was obviously dependent upon the times at which the bus was used and due to the fact that most employers work a normal day, the bus is used at peak periods when a certain amount of overcrowding is unavoidable. However, the results indicate that at present the driver/conductors are exercising little control over the number of commuters carried on any one trip and such action constitutes a severe safety risk. The only long term solution to this problem is for the service itself to provide more buses at peak periods.

(ii) "The nearest bus stop is far from your place of employment"

- A) Yes - 23%
- B) No - 77%

Although the answers given to this question appear to be straight forward, it must be emphasised that there may in fact be little

uniformity as each respondent will answer according to his/her definition of "far". However, in this respect the value judgments of this sample seem to indicate that from a spatial viewpoint, the present level of service offered is satisfactory. One complicating factor, which in practical terms is impossible to evaluate, is that the routes offered in suburban areas are certain to exert some influence on the employment pattern itself. Members of the Black labour market will probably be averse to taking up employment in any area too distant from the existing bus routes unless they can live on the premises of the employer. This will tend to limit the number of people who work "far" from the transport route.

(iii) "The trip takes too long"

- A) Yes - 13%
- B) No - 87%

Here again a problem of definition occurs, but because, in general, the Black townships are relatively close to the city, most commuters are not unduly perturbed about the time each trip takes.

(iv) "Buses running to schedule"

- A) Never - 14%
- B) Occasionally - 41%
- C) Frequently - 37%
- D) Always - 8%

It appears that the problem in this area during peak periods. During these periods, loading and off-loading times are at their greatest and the driver/conductor experiences great difficulty in keeping to the timetable. In the long run the only solution is, once again, to provide more buses during peak periods. In the short run, however, an increase in the use of season tickets could help to alleviate the problem. Although the position at present does not demand of immediate attention, the problem of running to schedule will have to be carefully considered in the near future.

Question 12 +

"How often do your employees use the bus service every week in order to get to work?"

The determination of the average frequency of bus usage is important in assessing the average amount spent on transport per month by bus users.

This figure can then be used to determine whether or not present bus fares are too low or too high, given that between 4,2% and 4,6% of the commuters' monthly income is an equitable amount to spend on transport. (1)

The total bus average rate of the sample taken in the residential areas was 473 times per week, or an average of 3,9 return trips. The average monthly usage rate is, therefore, 16,8 return trips. ++ On the assumption that this figure is representative and knowing that the vast majority of employees working in residential areas use Route B, costing them 14 cents return, the average cost of transport per month is then calculable at R2,35.

Question 13 +++

"How many days per week do your employees work?"

In the Central Business District the average number of days worked by employees per week was 5,9 or some 25,4 days a month. Knowing that Route A, at a price of 10 cents return, caters for the vast majority of these employees, the average monthly total spent on transport by those working in this area is R2,54.

+ Not applicable to the Central Business District sample.

(1) Refer Page 46

++ One month is taken as 4,3 weeks.

+++ Only for employers within the Central Business District.

Question 14

"What is the monthly income of your employees and what form of payment in kind does he/she/they receive?"

A) Residential area

The determination of average monetary income per employee proved to be a far more simple task than ascertaining in monetary terms the value of payments in kind. Total expenditure in the form of wages by respondents in this sample amounted to R3 622,00 per month, or an average of R27,03 per employee.

The average value of payments in kind and fringe benefits for this sample was R12,30 per month, the only significant item being food. + Combining this figure with the average monthly wage, the total average monthly income was R39,33.

B) Central Business District

In order to minimise disruption of work for employers of large numbers of labourers in the C.B.D., such employers were asked to give what they considered an average wage for their employees. As a result, there may possibly be a degree of inaccuracy in the wage figures quoted, even though employers were asked to consider their reply very carefully. Three respondents refused to supply any information on the wages they paid to their employees.

+ Many respondents were unable to give the exact amounts spent on fringe benefits and payments in kind. In such cases, an exact description of the type of assistance was noted and a monetary value allocated on the basis of experience of other respondents. (See Annexure A Page (xiv)

According to the data supplied, the average wage paid in the C.B.D. is R79,00 per month. Fringe benefits and payment in kind were practically non-existent in this sample. Four employers provided food for their employees and three of the more highly paid employees were on a medical and pension scheme of sorts, the extent of which was not disclosed. It must, therefore, be taken that the minimum average monthly income for this particular sample is R79,00 per month, although the true figure is not likely to be significantly greater.

CONCLUSIONS

1. There is a heavy reliance, by non-whites in this region, on public transport facilities. This, associated with the fact that wages are generally low, indicates the profound social impact which will be linked to the operator's pricing policy. As a result, there may be a necessity, on the part of the operator, for a preoccupation with costs (against the recommendations of most transport economists). This, however, is feasible as long as the revenue implications of any cost exercise are carefully pre-determined.
2. Subsidisation, although significant in suburban areas, is not at a level where it can be seriously considered when attempting to develop a new pricing strategy.
3. At present the majority of employers are either satisfied with or have little idea of the quality of the bus service. These attitudes in essence amount to very much the same thing.
4. Consumers of any good or service tend to be, if nothing else, extremely able critics. It is, therefore, difficult to evaluate with any certainty the degree of conviction associated with non-whites complaints about the service. However, attention must be given to commuters' feelings and

hence the provision of extra buses during peak periods to relieve overcrowding and enable adherence to the timetable must be considered; even if only as a medium to long term objective.

5. There is a strong feeling of sympathy, especially among employers of domestic labour, toward the financial predicament of employees. It is somewhat anomalous that this sympathy does not manifest itself in material terms as the average wage in the area is particularly low. However, given the general feeling of the community, employers may be receptive to an appeal for increased subsidisation of their employees' transport costs.
6. Despite the advantages of travelling on season tickets, a very small proportion of commuters actually use these at present. The scope for increased sales of season tickets is, therefore, good and such sales can undoubtedly be achieved if the tickets become more easily available to the general public.
7. (i) The average wage paid to employees in suburban areas (including payments in kind and fringe benefits) is R39,33 while the average monthly transport bill incurred by such employees is R2,35 or 5,9% of their income. This figure is 1,3% - 1,7% greater than the average amount (according to statistics of the P.H.S.L. and the H.S.C.) which should be expended in South Africa. (1) Price increases on the route which serves these areas should, on an equity basis, be withheld.
- (ii) The average wage paid to employees in the C.B.D. is R79,00 (including payments in kind and fringe benefits), while the average monthly transport cost incurred by employees in this region is R2,54 This amounts to 3,2% of the average monthly income and is

(1) Refer Page 46

1,0%,- 1,4% less than the 'equitable' amount which should be spent on transport in South Africa. (1) Price increases on the route which serves the C.B.D. can, on both economic and moral grounds, be justified.

(1) Refer Page 46

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CORPORATE POLICY AND THE PUBLIC TRANSPORT OPERATOR

Public transportation policy may be defined as the total system of integrated activities organised to achieve an effective relationship between the needs of present passengers, potential passengers, the general community and the service offerings of the operator. This in effect involves the efficient marketing of any particular transport service. The interface between carriers and markets is achieved through a judicious mix of service, promotional and distribution strategies as well as the utilisation of pricing alternatives available under conditions of regulation. (1)

A diagram of the marketing process in the context of public transport is presented in Diagram 6:1. This model is designed to relate various operational subsystems to the functioning of the marketing system as a whole.

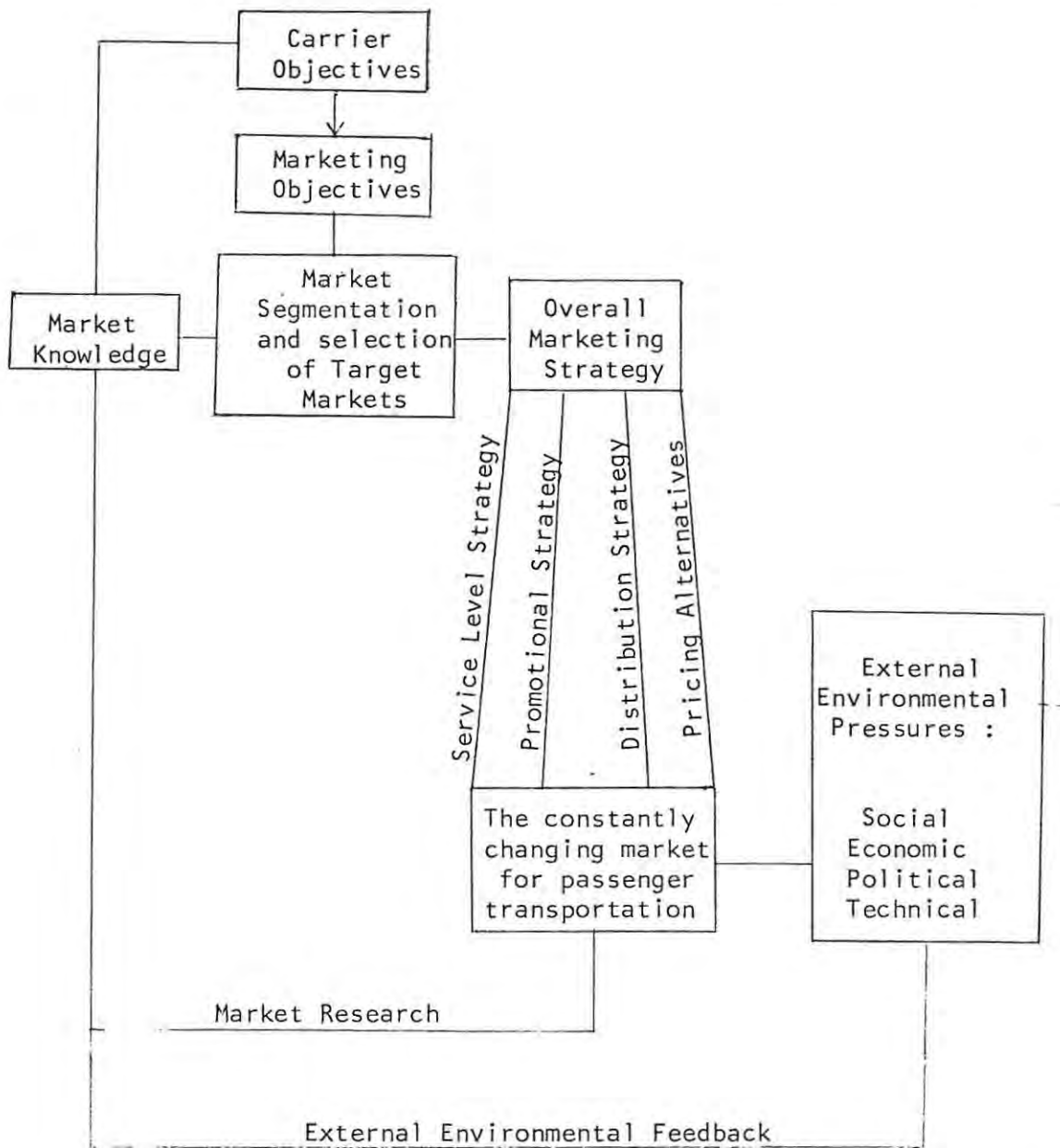
In recent years marketing has become increasingly important to transportation planners for a number of reasons.

1. Marketing is the revenue producing function of any firm or agency. There is no operating income until services are sold to passengers, and marketing encompasses all planning, production, distribution, promotional and sales activities ;
2. Passenger transportation has recently been characterised by a significant squeeze on profits and operating budgets. Labour, capital and fuel costs have tended to increase more rapidly than operating revenue. Under these conditions increases in productivity must be sought through more efficient utilisation of carrying capacity ;
3. The separation of the producers and consumers of public transportation continues to increase. Accurate information concerning the wants and needs of passengers and potential passengers is becoming more important, yet at the same time more difficult to obtain. Thus marketing research activities play an invaluable role in the enhancing of communications between carriers and their markets ;

(1) FARRIS M T AND HARDING F E : "Passenger Transportation"
Prentice - Hall Englewood Cliffs, New Jersey 1976 Page 151

Diagram 6:1

THE MARKETING OF PUBLIC TRANSPORTATION SERVICES



4. The long lead time required to obtain the approval of regulatory agencies for changes in rates emphasizes the importance of accurate market forecasting and analysis ;
5. Because of increasing risk factors and the higher costs involved in the development of new routes or in the expansion of capacity, it is essential to determine whether demand for these services is sufficient to produce an adequate return on investment ; and

6. The demand for public transport has recently gone through significant cycles and patterns of change. The marketing function provides a link between those producing transportation services and their markets through which adaptation to these cycles and patterns of change can be accomplished.

In general there are certain broad guidelines that may be useful to those involved in the marketing of public transportation services, as they consider the more specific articulation of objectives. These are :

- a) The marketing activities of every public transportor should be orientated toward meeting the needs of passengers, rather than the conveniences of management ;
- b) Marketing activities should be planned and should take place in a systems context ; and
- c) Efficiency (or profitability) should be a prime target.

These principles, however, although of undoubted value, tend to be somewhat too general in the practical sense. Their practical value is, in other words, limited to the extent to which the operator can translate them into direct functions of his operating environment. This can, in all probability, be achieved through a simple extension of the commonly accepted 'service level' hypothesis. +

1. ANALYSING SERVICE LEVELS

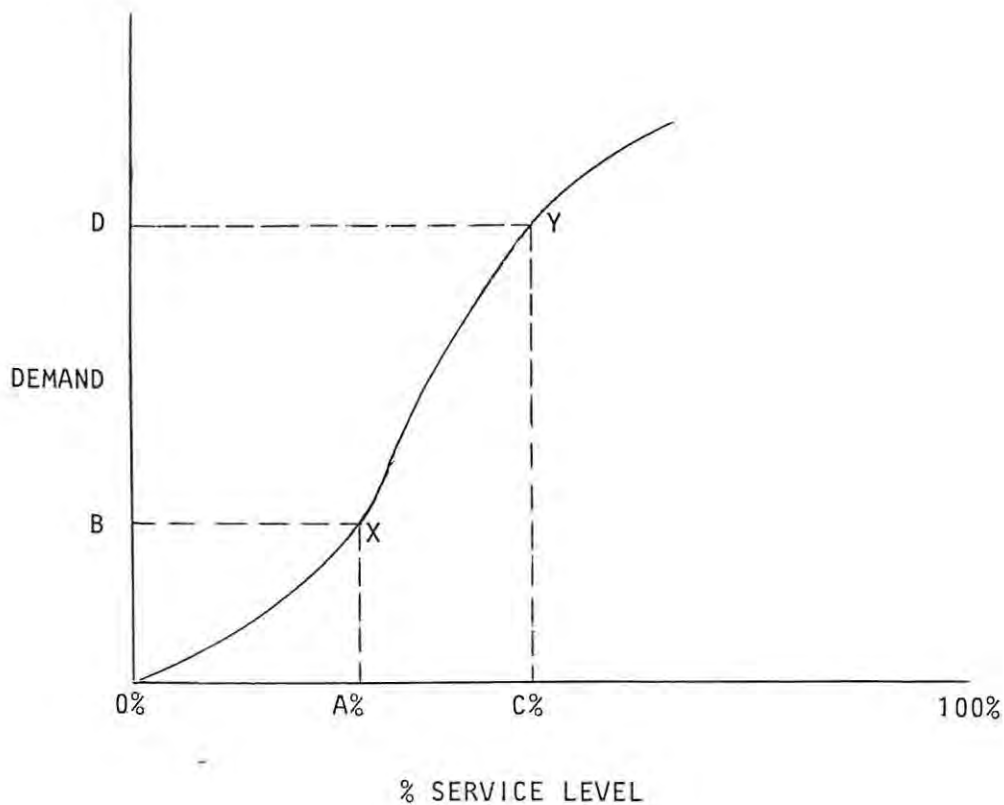
It is widely held that the relationship between the level of service accompanying a market offering and the demand for that offering will take the graphical

+ Service levels as concern public transport will be a function of spatial coverage, the number of trips made per route, the frequency of bus stops, the speed of trips, safety factors and capacity offered.

Note: Service levels do not take price into account. Although price is an integral part of utility, it is ignored in this concept.

form of an 'S' shaped curve. This concept is illustrated in Diagram 6:2

Diagram 6:2



An increase in the service level from 0% to A% results in a less than proportionate increase in demand, OB. In this situation, it is held that the service level is still so poor that it warrants little consideration. After A% an increase in the service level results in a more than corresponding increase in demand as people begin to take advantage of the improvement. For example, this may occur when an improvement in the transport service offered entices more members of the community to use this transport mode in preference to private vehicles. At a service level of C% saturation point is reached. Beyond this point, increases in the service level result in ever diminishing increases in demand. The reason for this situation arising is that the user of the service cannot adjust his own level of proficiency sufficiently enough to reap the benefits of the improvement. (2)

(2) CHRISTOPHER M : "Total Distribution"

Gower Press London 1971 Pages 87 - 93

Cost implications of the service level concept

The cost implications involved with this concept are given below, using Diagram 6:2 for convenience.

A) Origin to point X

Over this portion of the curve the operator is incurring high costs in relation to demand, due to the fact that his service is so poor.

B) Point X to point Y

Here, every cost associated with an increase in the service level brings about a more than proportionate increase in demand.

C) Beyond point Y

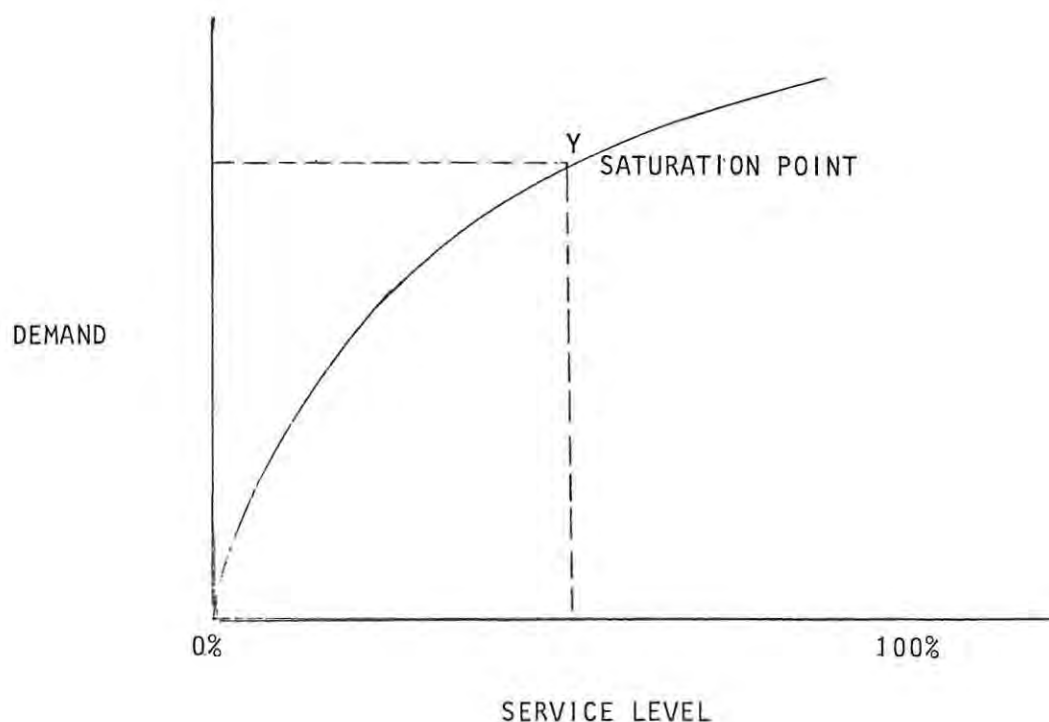
Over this section of the curve the cost of improved service becomes exorbitant in terms of the resulting demand.

According to this theory, it is, therefore, imperative that the operator keep his service level somewhere between points X and Y or preferably as close to point Y as possible (where the cost/revenue relationship is most favourable).

The service level concept and Non-White transport in South Africa

In general, non-whites in South Africa have very little option but to use the public transport systems provided by local or national authorities. It is, for many, the only way of travelling to areas outside walking distance. For this reason they are bound to show a greater degree of tolerance towards the service level, provided by any operator, than would their white counterparts. This will result in a distortion of the classical service level curve, as shown in Diagram 6:3

Diagram 6:3



Due to the lack of transport alternatives for the non-white, even a low level of service is sure to result in a disproportionately high demand response. At face level, therefore, it would appear that non-white transport undertakings have an advantage over their white counterparts, who are faced with a normal service level curve. However, the service level concept totally ignores the question of prices. If prices are too low then nowhere on the service level curve will the improvement of service bring in enough revenue to cover the extra cost incurred. In other words, improvements to the service level may increase more than proportionately the number of commuters carried, but each commuter pays such a low fare price that the extra revenue earned does not cover the incremental cost incurred. In reality it may not be the cost structure or the service level which is at fault, but rather the revenue structure, or alternatively the price level which is too low. This possible situation is strongly supported by Verburgh, Welgemoed and Cilliers, who state that the level of prices for all public transport in South Africa is far below corresponding

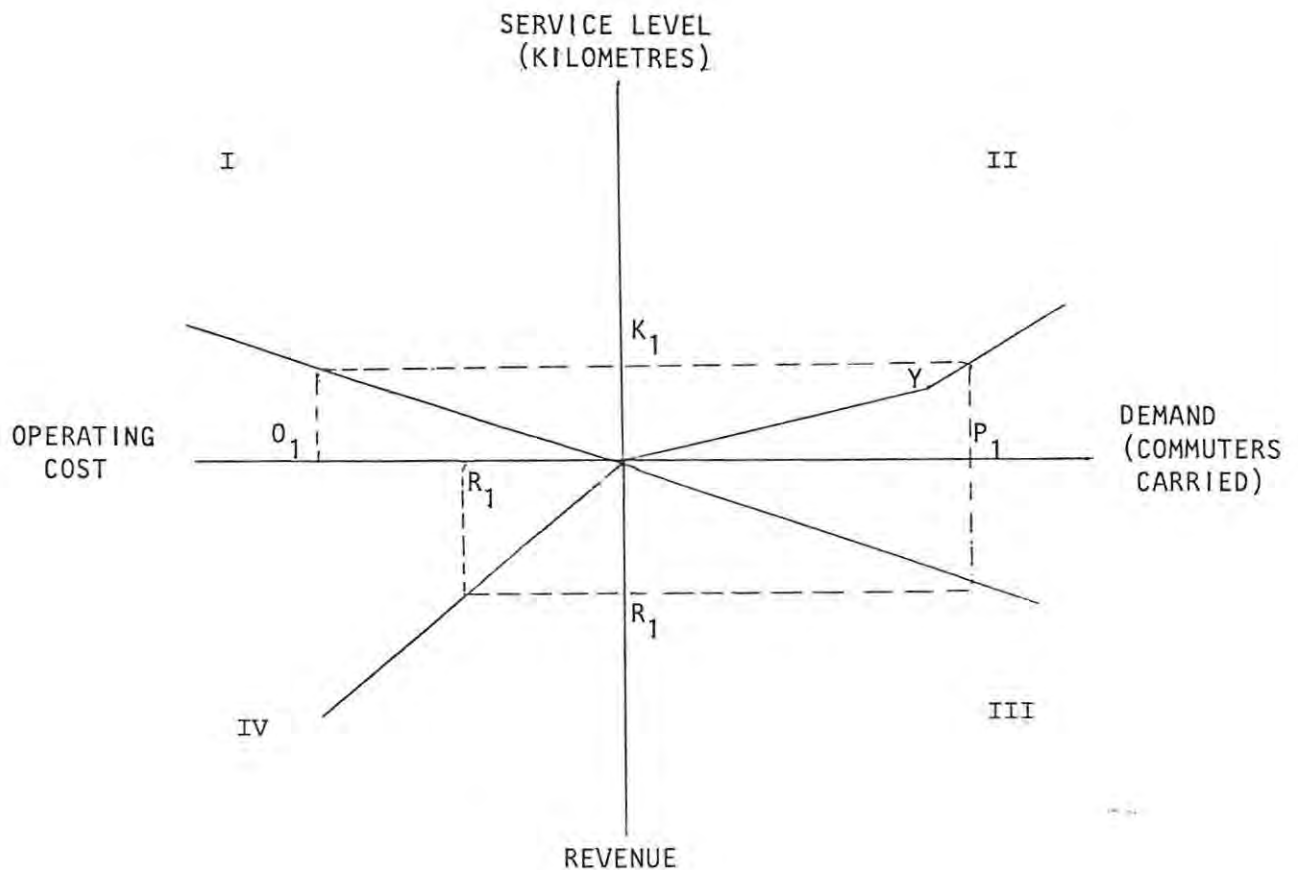
price levels abroad. (3)

The problem with non-white transport, and with the transport of most low income classes throughout the world, is that these commuters are in a relatively poor economic position, and the imposition of viable fare prices would seem to be morally unjust. The result is a conflict between moral considerations - alleviating the Blacks' economic position - and economic considerations - preventing the transport undertaking from making a loss. However, when the commuter is of significant importance to the welfare of the community in general, moral considerations must take preference. The transport concern is, therefore, forced to have a moral conscience for the economic good of society, yet in many cases society or government, does not reciprocate by subsidising any subsequent losses incurred by that concern. As a result, transport undertakings are forced to pay special attention to cost considerations in order to minimise these losses. Most public transport concerns are nationalised and such industries often, unfortunately, tend toward inefficiency. As a result, the constant demands for moral constraints are accompanied by an inability to institute effective cost savings.

In an instance where the revenue structure is constrained on moral grounds, efficiency must become the target criteria. Whether efforts to reduce costs are fruitful or not, this is the only area in which the possibility of economic success lies. On the assumption that limited flexibility is available in the pricing strategy, an indication of how to achieve efficiency can be shown by modeling the parameters, cost, revenue and service level in the following quadrant diagram.

(3) VERBURGH, WELGEMOED AND CILLIERS : op cit Page 74.

Diagram 6:4

Quadrant I

This quadrant contains a function showing the relationship between operating costs and the service level offered - measured in distance covered. The function is linear under the assumption that any increase or decrease in distance covered :

1. takes place on existing routes ; and
2. follows the same pattern as the existing distance covered.

These assumptions ensure that there will be the same proportion of stop/starts, maintenance costs, fuel consumption and administration expenses for every kilometre.

A movement along the function toward the origin implies a reduction in absolute costs, with the cost per kilometre ratio remaining constant. A reduction in operating costs per kilometre will shift the function towards the vertical axis and visa versa. At a distance of K_1 kilometres, the relevant operating costs are Q_1 .

Quadrant II

This quadrant contains a linear version of the service level graph postulated for non-whites in South Africa. This linear function serves to emphasise the position of the critical point Y after which demand becomes sluggish in response to changes in the service level. At service level K_1 demand is P_1 .

Quadrant III

Quadrant III contains a linear function representing the revenue earned as the number of commuters using the service changes. Like the cost per kilometre function, a change in the fares will have the effect of altering the slope of the function. A reduction of fares is represented by a movement toward the horizontal axis and visa versa. Each different possible function in this quadrant will also represent, for the individual, a certain percentage of expenditure from total income on transport. At demand P_1 revenue is R_1 .

Quadrant IV

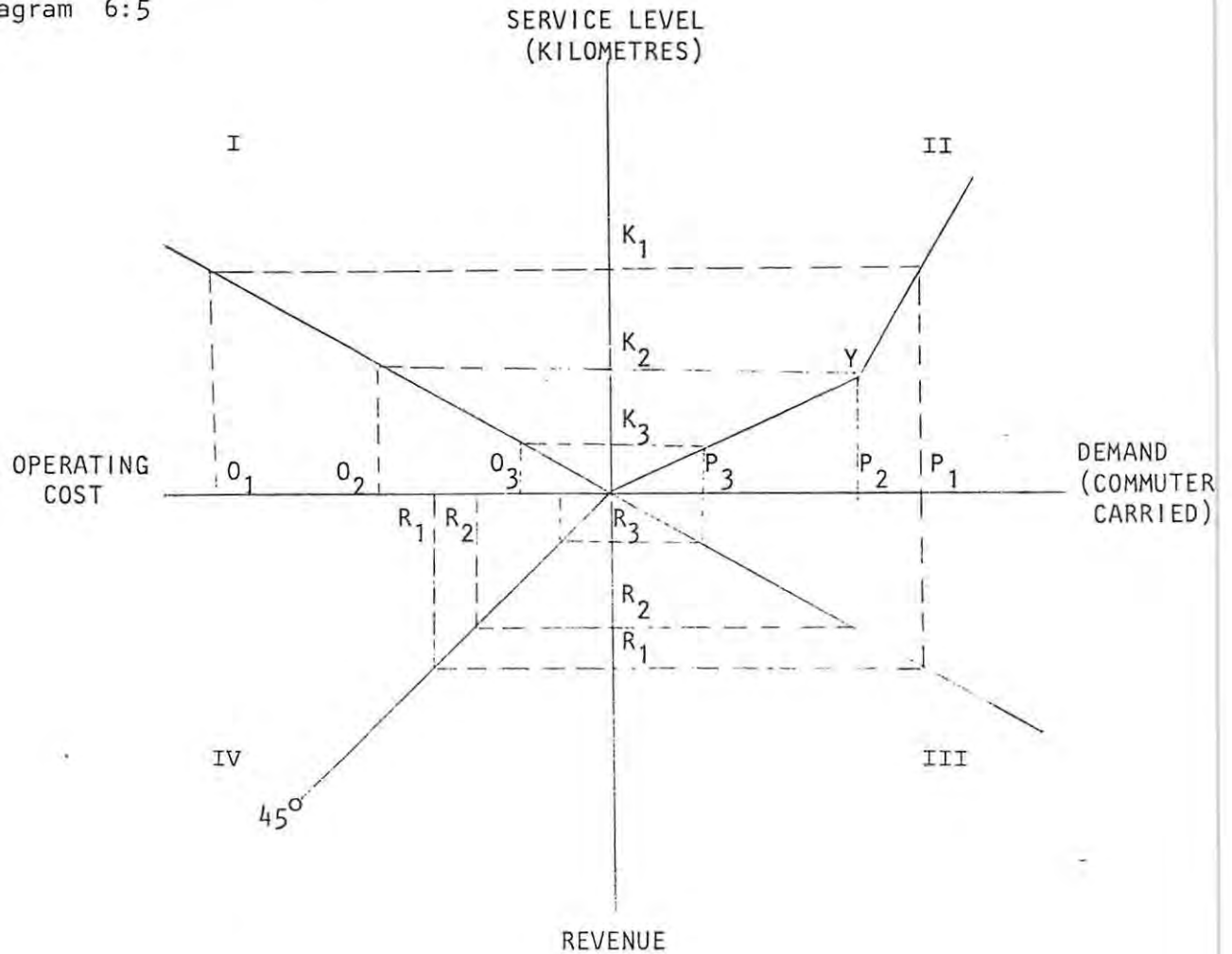
This quadrant contains a forty-five degree line for the purpose of projecting revenue onto the cost axis to facilitate easy comparison between the two.

This basic framework enables, firstly, an analysis of the effects of operating at various levels of service, and secondly, an analysis of the effect of different pricing alternatives.

A) The Static Case

The first case is designed entirely to test the service level function in Quadrant III. As such it is important that neither the cost/kilometres nor the revenue/demand functions exert any undue influence on the analysis. It is, therefore, necessary to ensure that the slope of both these functions is equal in their relevant quadrants.

Diagram 6:5



Case 1

Assume the undertaking is operating at a high level of service, (K_1) and is incurring a relatively high level of costs, (O_1). In this region of the service level function, every increase in revenue will be less than the cost of generating that revenue. The result is a loss of O_1R_1 . On the other hand, the degree of social and economic benefits to the community are relatively

high as a large number of commuters make use of the service offered.

Case II

Here the undertaking is operating at a low level of service, (K_3) and is thus incurring a relatively small amount of operating costs, (O_3). In this region of the service level function, the response of demand to increases in the service level is high. However, at this level of service, the potential demand for increased transport facilities is high and hence there is a considerable opportunity cost in terms of social and economic benefits foregone by the region. At this level of service a loss of O_3R_3 is incurred.

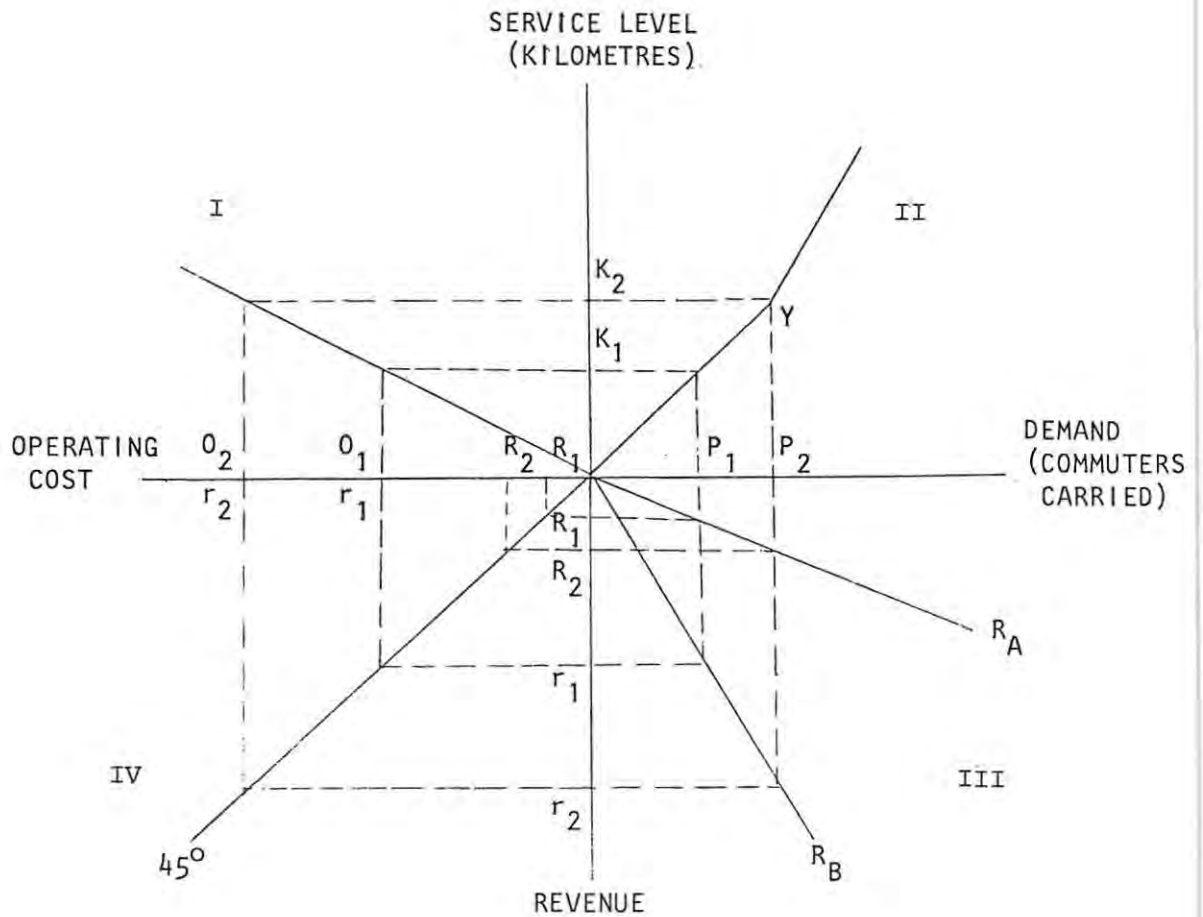
Case III

Operating at the critical point Y (service level K_2) will maximise social and economic benefits to the community, while at the same time avoiding the cost ineffectiveness of providing too high a service level. Operation at this point does not necessarily imply an excess of revenue over costs, it merely ensures that costs are minimised with the least resultant social and economic harm to the region concerned.

B) The Dynamic Case

In this case, it is assumed that the service level/cost function is constant. This means that at whatever service level the undertaking is operating, it is operating efficiently and functioning at the lowest possible level of costs. With this assumption it is possible to test both the service level function and alternative pricing strategies.

Diagram 6:6



Assume the transport undertaking is operating at a service level of K_1 , the corresponding level of costs will be O_1 and the number of passengers carried P_1 . If the existing level of fares gives rise to a revenue function of R_A , the operating loss incurred by the undertaking will be R_1O_1 .

If this undertaking were to attempt to cover all costs by an increase in the price of fares, then the revenue function must shift toward the vertical axis until it reaches R_B . Here the level of social and economic benefits to the region remain the same (because the service level and hence demand is constant), while commuters spend a larger proportion of their total income on transport. However, in order to approach the optimal situation, the undertaking should make both a price and a service level adjustment. By increasing the service

level to the critical point Y and raising the level of fares to R_B , revenue earned will again cover operating costs ($O_2 = r_2$), but the number of commuters carried will be far greater and hence so must be the social and economic benefits to the region served.

In essence, no matter what pricing alternatives are open to the undertaking, operation at the critical point is the most cost effective. However, in reality many operators attempt to decrease costs by decreasing the service level, and as shown in Diagram 6:5 this cannot lead to a betterment of the financial position unless the original level of service was extremely high, that is, beyond the critical point. The only area which is left open to manipulation, especially when the price structure must remain relatively constant, is that of costs. By increasing efficiency, the cost per kilometre ratio must decrease, shown diagrammatically by a shifting of the function in Quadrant I towards the vertical axis, thereby increasing the financial viability of the service. Therefore, once prices have been set at what is considered the optimal level, bearing in mind community social and economic pressures as well as external pricing regulations, a concentration upon costs is essential.

The integrated service level model postulated above may be subject to two criticisms, neither of which detracts seriously from its validity.

1. It implies a perfectly inelastic demand as the number of users remains constant after a price increase has been initiated.

However, firstly, in practical terms elasticity is often a function of the size of the change in price. Where price changes are small in real terms, demand is usually very inelastic. In most instances, transport operators are severely limited in the extent to which they can institute price increases. Secondly, because non-whites generally have little option as to the type of transport they are going to use, demand may be expected to have a relatively high natural degree of inelasticity.

2. The model is very difficult to test empirically. The extent of control needed in order to be able to analyse the cost and revenue implications of a service level alteration may be difficult to achieve.

On the other hand, the concept is important in that it shows clearly the profitability factors involved in public transport as well as the relationship between these factors. Only once this has been understood by the operator is he in a position to :

1. analyse the profit gap implications of his present operation ;
2. alter his revenue structure, where possible, in order to achieve greater financial viability ;
3. scrutinise his cost levels, both from an operations viewpoint (altering the absolute cost structure) and from an efficiency viewpoint (altering the relative cost structure) ; and
4. determine whether any impending cost or revenue adjustments will be made within an acceptable level of service (market research).

2. PROFIT GAP ANALYSIS

In order to obtain an indication of future policy needs, the researcher must initially determine the future financial predicament of the undertaking should nothing be done to alter either the present level of operations or the cost and revenue structures. The calculation of this "profit gap" is tabulated below for the Grahamstown Municipal Bus Service.

Table 6:1

FORECASTED PROFIT GAP 1976 - 1980

YEAR	FORECASTED COST (1)	FORECASTED REVENUE (2)	PROFIT GAP
1976	R168 058,00	R105 429,00	R 62 629,00
1977	R194 493,00	R116 536,00	R 77 957,00
1978	R220 929,00	R126 242,00	R 94 687,00
1979	R247 366,00	R136 649,00	R110 717,00
1980	R273 802,00	R147 055,00	R126 747,00

(1) Refer Table 4:7 B Page 73

(2) Refer Table 3:11 Page 59

Table 6:1 gives concrete evidence of the extent to which corrective action must be applied to the present service in order to ensure financial viability, or alternatively, minimisation of operating losses.

3. IMPROVING THE REVENUE STRUCTURE

The following recommendations could be made to the Grahamstown Bus Service in order to help fill the future profit gap it is facing :

1. Price increases on Route A are equitably justifiable as long as commuters spend only 1,2% - 1,6% more of their total income on transport. (1) Given that the average monthly income of these commuters is R79,00 (2) these figures imply a total monthly expenditure of R3,32 - R3,64 on transport. As the average employee in the region served by this route works 25,4 days per month, (3) an equitable fare price would lie within the range of 14 cents - 16 cents for a return trip as compared with 10 cents return charged at present.

Calculating the revenue implications of such a price increase is complicated by the fact that there is no means of determining how the price elasticity of demand will move with such an increase. However, working from previous experience it can be logically argued that as the previous price increase made on this route (67%) (4) resulted in 23% of commuters leaving the market (5) (including the 13,5% natural market growth rate), an additional price increase of 60% (from 10 cents - 16 cents) could be expected to result in a further 21% decrease in demand. Accordingly, without allowing for the natural market growth rate, the number of commuters carried in 1976 would be 408 991. It must be emphasised that this is the best possible situation which could arise as, in effect, the elasticity of demand has been kept constant, whereas, in reality, it could be expected to increase.

(1) Refer Page 88

(2) Refer Page 88

(3) Refer Page 86

(4) Refer Page 46

(5) Refer Pages 53 - 54

The revenue implications of this price increase are given in Table 6:2.

Table 6:2

ROUTE A : FORECASTED EARNINGS AT 16 CENTS PER RETURN TICKET
1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	R408 991,00	R55 214,00	R464 205,00	R37 136,00
1977	R464 205,00	R62 668,00	R526 873,00	R42 150,00
1978	R526 873,00	R71 127,00	R598 000,00	R47 840,00
1979	R598 000,00	R80 730,00	R678 730,00	R54 298,00
1980	R678 730,00	R91 629,00	R770 359,00	R61 629,00

By calculating the forecasted revenue from keeping the price as it is (10 cents), it becomes possible to determine the monetary contribution the price increase will make towards closing the forecasted profit gap.

Table 6:3

ROUTE A : FORECASTED EARNINGS AT 10 CENTS PER RETURN TICKET
1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	R517 710,00	R 69 891,00	R587 601,00	R29 380,00
1977	R587 601,00	R 79 326,00	R666 927,00	R33 346,00
1978	R666 927,00	R 90 035,00	R756 962,00	R37 848,00
1979	R756 962,00	R102 190,00	R859 152,00	R42 958,00
1980	R859 152,00	R115 986,00	R975 138,00	R48 757,00

The forecasted extra revenue earned from increasing prices on Route A from 10 cents to 16 cents return is therefore :

1976	-	R 7 756,00
1977	-	R 8 804,00
1978	-	R 9 992,00
1979	-	R11 340,00
1980	-	R12 872,00

2. The price of bus tickets to school children should be increased from 3 cents to 5 cents, (or 6 cents to 10 cents per return trip). The logic behind this recommendation is as follows :
- a) it is relatively easy for young members of the labour market to pretend to be school children and thus take advantage of the very low price presently charged. Considering that non-white school children tend to vary widely in age, it may be relatively easy for those so inclined to masquerade as scholars ;
 - b) all schools are situated within the township, which is itself relatively small (housing approximately 20 000 people). Most schools should, therefore, be within easy walking distance for scholars who are at present, in all probability, merely taking advantage of the low prices and undoubtedly contribute to the peak period problem in the morning ; and
 - c) the high degree of inelasticity associated with this ticket category (0,22) (1) indicates a strong opportunity to add to the lagging annual earnings of the undertaking.

The revenue implications of this price increase, again assuming constant elasticity, are outlined below.

The previous price increase of 50% in this ticket category resulted in 38 050 commuters (11,2% of the total) leaving the market (2), while 301 496 continued patronising the service. Therefore, with a further price increase of 67%, it may be expected that another 15% of commuters will stop using the service, leaving a total of 256 272 patrons in 1976. Making allowance for the 13,5% natural market growth rate, the implications of this price increase are given in Table 6:4.

Table 6:4

SCHOOL CHILDRENS FARES : FORECASTED EARNINGS AT 10 CENTS
PER RETURN TICKET 1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	256 272	34 596	290 868	R14 543,00
1977	290 868	39 267	330 315	R16 507,00
1978	330 315	44 568	374 703	R18 735,00
1979	374 703	50 584	425 287	R21 264,00
1980	425 287	57 414	482 701	R24 135,00

(1) Refer Page 53

(2) Refer Page 53

The expected revenue from this ticket category should prices remain constant at 6 cents, is tabulated below.

Table 6:5

SCHOOL CHILDREN FARES : FORECASTED REVENUE AT 6 CENTS
PER RETURN TICKET 1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	301 496	40 701	342 197	R10 266,00
1977	342 197	46 196	388 393	R11 651,00
1978	388 393	52 433	440 826	R13 224,00
1979	440 826	59 511	500 337	R15 010,00
1980	500 337	67 545	567 882	R17 036,00

The difference between the revenue implications given in Tables 6:4 and 6:5 will give the total annual contribution made by the price increase toward closing the forecasted profit gap.

1976 - R4 277,00
 1977 - R4 856,00
 1978 - R5 511,00
 1979 - R6 254,00
 1980 - R7 099,00

3. The analogy of the recommended pricing structure thus far is that on equity grounds the price of the shorter route, Route A, is greater than that of Route B. This arose out of adherence to the principle that no commuter should spend more than 4,2% - 4,6% of his income on transportation. (1) This analogy can obviously not be allowed to exist and management must decide on whether to keep the prices on Route B at an equitable level and forego the benefits outlined in recommendations 1 and 2 or to adhere to these recommendations and charge inequitably high prices on Route B. The author maintains that the latter option is preferable for the following reasons :
- a) Route B is entirely responsible for the financial burden being incurred by the undertaking. (2) While it would be morally satisfying to charge prices which are not economically feasible, cognisance must be

(1) Refer Page 46

(2) Refer Table 2:9 Page 32

taken of the fact that in the long run the entire service will suffer should Route B continue to place this burden on the undertaking ; and

- b) due to the fact that 53% of employers of domestic labour would be willing to subsidise, either fully or partially, an increase in fare prices (1), the actual decline in commuter useage on this route should be smaller than that derived through any normative analysis.

Therefore, in order to reap the benefits of price increases on the other two ticket categories, it would be advisable to increase the price of fares on Route B from 14 cents to 20 cents return. This is an increase of 43% and according to previous experience with price raising on this route (2), a decrease in demand of 40% can be expected. Allowing for an expected market growth rate of 13,5%, the implications of this price increase may be tabulated as follows :

Table 6:6

ROUTE B : FORECASTED EARNINGS AT 20 CENTS PER RETURN TICKET
1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	164 513	22 209	186 722	R18 672,00
1977	186 722	25 208	211 930	R21 193,00
1978	211 930	28 611	240 541	R24 054,00
1979	240 541	32 473	273 014	R27 301,00
1980	273 014	36 857	309 871	R30 987,00

Without this price increase the expected revenue from Route B for 1976 - 1980 is given in Table 6:7.

Table 6:7

ROUTE B : FORECASTED REVENUE AT 14 CENTS PER RETURN TICKET
1976 - 1980

YEAR	SINGLE TRIP COMMUTERS	MARKET GROWTH RATE (13,5%)	TOTAL CARRIED	REVENUE IMPLICATIONS
1976	278 835	37 643	316 478	R22 154,00
1977	316 478	42 726	359 203	R25 145,00
1978	359 203	48 492	407 695	R28 536,00
1979	407 695	55 039	462 734	R32 391,00
1980	462 734	62 469	525 203	R36 764,00

(1) Refer Page 80

(2) Refer Pages 53 - 54

Tables 6:6 and 6:7 indicate that the suggested price increase will serve to widen the forecasted profit gap for the years 1976 - 1980, the decrease in revenue being :

1976 - R3 482,00
 1977 - R3 951,00
 1978 - R4 482,00
 1979 - R5 090,00
 1980 - R5 777,00

There are, however, four reasons why the price increase should nevertheless be implemented.

- a) due to the fact that this route runs at a considerable operating loss any downward adjustment of the service in order to meet the lower demand will bring about a greater decrease in costs than in revenue ;
- b) if the price on Route B remains at 14 cents return, the expected benefits to be derived from the increased fares on Route A and for school children will be lost. These benefits together total more than the expected decrease in revenue on Route B after implementing the new price ;
- c) the financial forecast made in Table 6:6 is based on the premise that a 40% decrease in demand will result if prices are increased to 20 cents return. There are a number of reasons why this premise may in fact be false.

In the first instance, of the two routes offered by the service, Route B is the one which is least predictable in terms of demand. The original prices charged on Route A and Route B were 3 cents and 5 cents respectively. At these prices it is not inconceivable that many commuters were using Route B buses to reach a destination covered by Route A merely because this was more convenient to them at the time. However, when prices were increased to 5 cents and 7 cents respectively, the greater absolute cost of travelling on a Route B bus may have forced these commuters to reconsider their previous consumption pattern and use only Route A buses. This will have resulted in a large proportionate decrease in demand, one which it is doubtful will be repeated now that a more true demand pattern has been explored ; and

- d) with the rate of subsidisation of the majority of these commuters running at 53%, it is logical to assume that there will be a smaller proportionate decrease in demand with any subsequent price increase.

With a lack of quantifiable data, it is nevertheless necessary to use the more pessimistic approach given in Table 6:6.

The net effect of recommendations 1, 2 and 3 is given in Table 6:8.

The revenue structure of this service is severely constrained by the generally low income and employment levels existing in Grahamstown. Until there is a considerable improvement in these two variables, the undertaking will, of necessity, face certain liquidity problems.

4. IMPROVING COSTS WITHIN DEFINED COST CENTRES

Due to the fact that most transport undertakings are characterised by relatively inflexible fuel costs & wage and salary expenses, maintenance and repairs is in essence the only cost centre which can be placed under constructive analysis.

The following recommendations should be made to the Grahamstown Bus Service in order to improve the maintenance and repair costs it is incurring.

1. Preventive maintenance is an essential business policy where breakdowns can be predicted to any reasonable degree. By analysing the frequency of maintenance and repair items (1), several opportunities will arise for the undertaking to reduce costs.
 - a) the ordering of spare parts can be pre-planned. Many suppliers of spares have long lead times and hence if an order is placed after a breakdown has occurred, the bus concerned may be kept out of commission for an unnecessarily long period ;
 - b) preventive maintenance enables the scheduling of work and facilities for repair. Due to the fact that the Grahamstown service is small, maintenance and repair facilities are capable of handling only one repair item at a time. Where preventive maintenance is not employed, work flows tend to be erratic and the queueing of work items results in either excessive delays or low quality repairs, both of which are extremely costly. During slack periods a high opportunity cost arises as personnel and equipment are idle ; and

(1) Refer Table 4:5 Page 69

FIRST ADJUSTED PROFIT GAP 1976 - 1980

YEAR	FORECASTED PROFIT GAP (1)	EXTRA REVENUE ON ROUTE A (2)	EXTRA REVENUE FROM SCHOOL CHILDREN (3)	DECREASE IN REVENUE ON ROUTE B (4)	FIRST ADJUSTED PROFIT GAP
1976	R 62 629,00	R 7 756,00	R4 277,00	R3 482,00	R 54 078,00
1977	R 77 957,00	R 8 804,00	R4 856,00	R3 951,00	R 68 248,00
1978	R 94 687,00	R 9 992,00	R5 511,00	R4 482,00	R 83 666,00
1979	R110 717,00	R11 340,00	R6 254,00	R5 090,00	R 98 213,00
1980	R126 747,00	R12 872,00	R7 099,00	R5 777,00	R112 553,00

(1) Refer Table 6:1 Page 103

(2) Refer Pages 105 - 106

(3) Refer Pages 107 - 108

(4) Refer Page 109

c) when a breakdown does occur it often causes damage to other associated parts of the bus which were previously sound.

2. An analysis should be undertaken of the cost of maintenance, repairs and comparative fuel consumption of each bus. On these criteria, poor performers will generally be found to be older buses. This analysis can then serve as a basis for the comparison of the costs involved in keeping a bus in operation and the interest and redemption costs of purchasing a new bus. The final product will be a reliable indication of when to scrap old buses.

5. OPERATING RECOMMENDATIONS

If this bus service was to attempt to reduce costs merely through a reduction of the existing service such drastic action would be required that serious commuter reaction would be inevitable. It is, therefore, necessary to propose other means of operating which will possess the desired characteristics of being both less costly and acceptable to commuters.

1. A close study of the existing routes serviced by this undertaking is essential. At present Routes A and B leave the township from exactly the same place and travel the same course for the first $4\frac{1}{2}$ kilometres. Route A stops at this point, while Route B continues into the residential area to distribute and collect domestic labour. After 6 kilometres, it rejoins Route A and they both return to the township. + This is an extremely costly duplication of services.

In order to maximise the productivity of existing capacity, all commuters should be forced to take Route A to its destination which can then be used as a staging point for Route B. ++ Should this policy be followed, Route A (according to normative analysis) would carry a total of 941 795 passengers (including the market growth rate) in 1976. This total is divided amongst

+ See Annexure B

++ See Annexure C

the three ticket categories as follows :

- a) 464 205 who will use the original Route A only ; (1)
- b) 186 722 who will use Route A and then the new Route B ; (2) and
- c) 290 868 school children using either a) or b) above. (3)

However, according to revenue recommendation 3 (4) it is unlikely that the number of 20 cent commuters (those using both Route A and B) will fall to as low as 186 722. For this reason it would be more realistic for management to provide a service which will be able to cater for the maximum ticket category. According to Table 6:7 (5), this is 316 478 passengers per annum making the revised total to be carried by Route A in 1976, 1 053 551.

The number of extra commuters who can be transported on the existing capacity offered on Route A will be dependant upon the excess capacity on this Route at present. Calculating excess capacity, however, is by no means an easy task. For example, contrary to common belief, peak periods are not as profitable as would be expected due to the fact that all traffic is one way - either into or out of the urban centre. Because the return trip in both cases is empty, each bus is only operating at 50% of its total capacity. In fact if the service is regulated correctly the most efficient period of the day is just before and just after midday when some commuters are entering and some leaving the urban centre. Conversely, the most inefficient time period is that immediately after peak hours when buses are not quite full and yet still return empty. In the author's opinion, therefore, any service which can utilise 35% of its capacity may be considered acceptably efficient.

(1) Refer Table 6:2 Page 105

(2) Refer Table 6:6 Page 108

(3) Refer Table 6:4 Page 106

(4) Refer Page 107

(5) Refer Table 6:7 Page 108

The average capacity of the buses used in Grahamstown is 64 passengers. At an average of 35% of total capacity (22,5 commuters) this service would require 11 706 return trips in 1976 in order to transport the 1 053 551 passengers forecasted for that year. This would give an average of 225 trips per week. The fact that at present 202 return trips are used to transport only those passengers using Route A (1), gives some indication of the extent to which commuters have been provided for at totally uneconomic periods of the day.

The total cost of operating the extra 23 trips per week (1 196 trips per annum) can be calculated as follows :

- a) the cost forecast for 1976 (R168 058,00) (2) indicates that total costs per kilometre would be 48 cents ;
- b) the extra 1 196 trips per annum at 9 kilometres each, would, therefore, cost R5 177,00 ; and
- c) the future cost of these trips can be forecasted on an index basis using the indexed increase in costs of 42 points per annum derived in Table 4:7 A (3)

Table 6:9

ROUTE A : FORECASTED COST OF RUNNING EXTRA BUSES 1976 - 1980

YEAR	INDEX	INCREMENTAL COST
1972	100	R1 939,00-
1976	267	R5 177,00
1977	309	R5 992,00
1978	351	R6 806,00
1979	393	R7 620,00
1980	435	R8 435,00

(1) Refer Table 2:6 Page 29

(2) Refer Table 6:1 Page 103

(3) Refer Table 4:7A Page 72

The capacity required to service the recommended Route B must again be calculated on the basis of the maximum possible number of commuters who could use this route. However, because it caters largely for domestic servants, it is doubtful whether an efficiency level of 35% can be attained by the service. This is due to the fact that the working hours of domestic servants are not as rigid as those of employees in the commercial sector and hence peak periods are less pronounced. The resulting greater temporal spread of demand indicates that on the average fewer persons will be carried per bus than on Route A. For this reason, an analysis of the number of buses necessary to transport all Route B commuters is conducted at 30% of total seating capacity.

The maximum number of commuters to be transported on Route B in 1976 is forecasted at 461 912, consisting of 316 478 in the domestic servant category and 145 434 school children. At an average of 30% of the seating capacity (19 persons per trip), this will require 6 077 return trips in that year or some 117 per week. Given a total cost per kilometre of 48 cents (1) and knowing that each trip is 6 kilometres, the cost of these trips is R17 502,00. Using an indexed increase in costs of 42 points per annum, the total future cost of this route is given in Table 6:10.

Table 6:10

AMENDED ROUTE B : FORECASTED COST 1976 - 1980

YEAR	INDEX	FORECASTED COST
1972	100	R 6 555,00
1976	267	R17 502,00
1977	309	R20 256,00
1978	351	R23 008,00
1979	393	R25 761,00
1980	435	R28 514,00

(1) Refer Page 114

According to the existing timetable, the Grahamstown Bus Service is operating 250 Route B trips per week (13 000 trips per annum). Each of these trips covers 15 kilometres and at 48 cents per kilometre the total 1976 cost of this route was R93 600,00. Using the indexed cost increase of 42 points per annum, the total cost forecast for the existing Route B is given in Table 6:11.

Table 6:11

EXISTING ROUTE B : FORECASTED COSTS 1976 - 1980

YEAR	INDEX	FORECASTED COST
1972	100	R 35 056,00
1976	267	R 93 600,00
1977	309	R108 323,00
1978	351	R123 047,00
1979	393	R137 770,00
1980	435	R152 494,00

Table 6:12 illustrates the benefits to be derived from operating under the recommended Route A and B system.

The marginal profit indicated in Table 6:12 may be taken as a conservative estimate of the services true potential financial viability due to the fact that all cost estimates have been made on the basis of a maximum number of commuters, while the corresponding revenue estimates have been forecasted at minimum patronage.

2. The implementation of the new Route A will involve 225 return trips per week. (1) According to daily statistics of demand for transport facilities, (2) the distribution of these trips by day of the week should be as follows :

Monday	16%	-	36 trips
Tuesday	14%	-	31 trips
Wednesday	16%	-	36 trips

- (1) Refer Page 114
 (2) Refer Pages 20 -23

FINAL ADJUSTED PROFIT GAP 1976 - 1980

YEAR	FIRST ADJUSTED PROFIT GAP (1)	EXTRA COST OF AMENDED ROUTE A (2)	COST OF AMENDED ROUTE B (3)	SAVINGS FROM SCRAPPING ORIGINAL ROUTE B (4)	FINAL PROFIT GAP
1976	R 54 078,00	R5 177,00	R17 502,00	R 93 600,00	- R16 843,00
1977	R 68 248,00	R5 992,00	R20 256,00	R108 324,00	- R13 828,00
1978	R 83 666,00	R6 806,00	R23 008,00	R123 047,00	- R 9 567,00
1979	R 98 213,00	R7 620,00	R25 761,00	R137 770,00	- R 6 176,00
1980	R112 553,00	R8 435,00	R28 514,00	R152 494,00	- R 2 992,00

(1) Refer Table 6:8 Page 111

(2) Refer Table 6:9 Page 114

(3) Refer Table 6:10 Page 115

(4) Refer Table 6:11 Page 116

Thursday	16%	-	36 trips
Friday	27%	-	61 trips
Saturday	9%	-	20 trips
Sunday	2%	-	5 trips

For the sake of uniformity in the timetable, it would be preferable to have 36 trips every day from Monday to Thursday. Due to the fact that Sundays account for only 2% of the weekly traffic (225 return trip passengers) it would be beneficial to the undertaking, and only marginally disrupting to commuters, to cease operations on this day. Those who need transport on Sundays (church groups and educational institutions, for example) should be approached to arrange for the provision of special buses solely for their use.

3. The instituting of the amended Route B, operating solely from a staging point, will require 117 return trips per week. (1) Although demand for this route may vary marginally from that for the existing route, the daily passenger trends for the existing route (2) may provide an answer for the most beneficial distribution of these trips by day of the week.

Monday	15%	-	18 trips
Tuesday	16%	-	19 trips
Wednesday	17%	-	20 trips
Thursday	17%	-	20 trips
Friday	25%	-	29 trips
Saturday	7%	-	8 trips
Sunday	3%	-	4 trips

Again for the sake of uniformity in the timetable, 20 return trips should be run every day Monday to Thursday. No buses will run on Sunday as no patrons can reach the staging point if Route A is not operating. (3)

-
- (1) Refer Page 115
 - (2) Refer Pages 20 - 23
 - (3) Refer Page 117

4. It is imperative that this service make some kind of analysis of the temporal fluctuations in demand per day of the week. Without this, buses may run at completely uneconomical times of the day and the benefits of the previous operating recommendations will be negated. Bus drivers should be made responsible for the collection of such data by means of a prescribed form such as illustrated below.

DATE		DRIVERS NAME	
BUS NUMBER		SHIFT	
TIME			
NUMBER OF PASSENGERS EMBARKING	NUMBER OF PASSENGERS IN EN ROUTE		TOTAL NUMBER OF PASSENGERS CARRIED
	TALLY	TOTAL	
E.G. 20	2 + 9 + 7 + 2	20	40

In this way buses can be withdrawn from the service at times when 35% (or 30% in the case of Route B) of the seating capacity is not being filled, and an accurate check can be kept on seasonal as well as total fluctuations in demand.

Once a concrete pattern has emerged, this procedure need only be repeated every three to four months.

6. ADMINISTRATIVE RECOMMENDATIONS

The undertaking must employ some inspectors/policemen who can check on driver at random to ensure they are not stealing money by refusing to issue tickets to commuters when the fare is tendered to them. Such inspectors can also help to control rowdiness and damage to buses over weekends.

All records pertaining to any facet of the operation should be filed with the transport manager. At present he has access only to revenue records, while

all cost data is processed and held at the municipal offices. The geographical separation of these records creates difficulties in keeping abreast of important developments, whether they be latent or real.

The sale of season tickets should be introduced into Route A, as this is the route which carries the majority of commuters. Substantial advantages would be gained through a speed up of loading and off-loading times and a reduction of the temptation on the part of drivers to appropriate money from the undertaking. In order to stimulate the sale of season tickets, drivers should be allowed to sell such tickets on their buses.

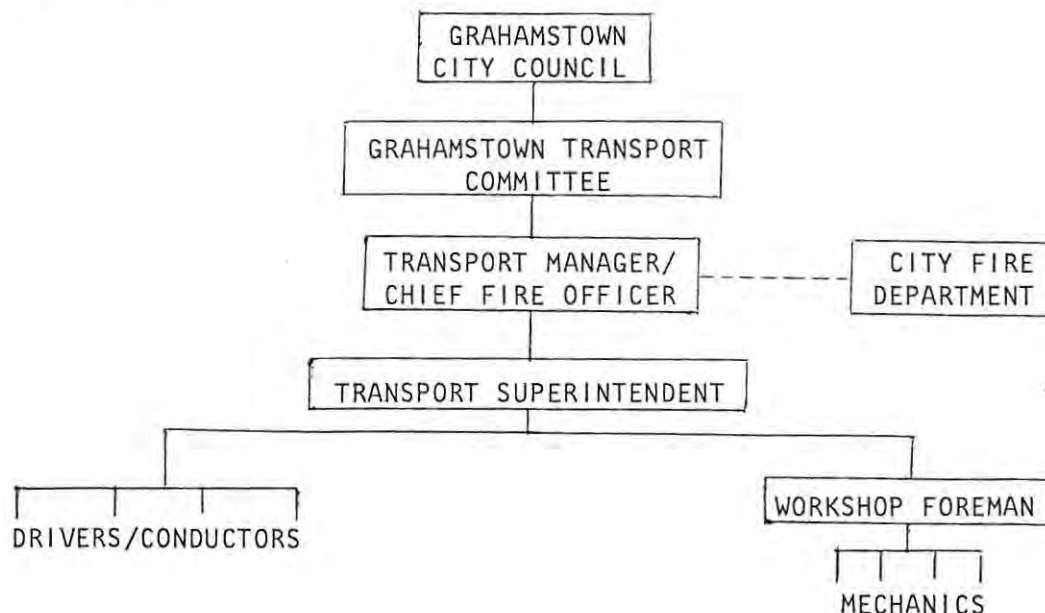
ORGANISATIONAL ANALYSIS

The organisational structure is of interest in the analysis of any form of business as it tends to illustrate any one or more of the following :

- a) the real decision making centres ;
- b) areas of potential light and heavy work load ; and
- c) the degree of control possible and the efficiency of work and communications flow.

The present organisational structure of the Grahamstown Municipal Bus Service is given in Diagram 6:2.

Diagram 6:2



The Grahamstown Transport Committee is, in effect, controlled by the municipality as it is composed largely of city councillors and high ranking municipal employees. It is concerned with all policy making decisions and is in continual liaison with the Transport Manager and the local Bantu Urban Council. The actual Transport Department is attached to the City Fire Department. They share common administration facilities and the Transport Manager is also the Chief Fire Officer. The Transport Superintendent is responsible for the day to day operations of both workshop personnel and the drivers/ conductors.

This organisational structure shows two weak points :

- a) the composition of the Transport Committee indicates that there may be a tendency at this level to concentrate on general municipal viability rather than on the viability of the transport service itself. As long as restrictions are placed on the transport system for the benefit of unrelated considerations, the full potential of such a service cannot be realised.

The essential problem is that because the municipality provides the funds for the operation of the service, it needs some control over this capital it has invested. The ideal solution to this problem is to have no more than 50% of the voting power of the Transport Committee in the hands of the municipality. In this way it will have the power of veto, but cannot force upon the service decisions which are not in the true interests of that service ; and

- b) the Transport Manager/Chief Fire Officer is in the unenviable position of having to perform two specialised and completely unrelated tasks. It is unlikely that the efficiency of either of these operations is benefiting from this situation and in terms of work load, a severe stress is placed on this section of the organisational structure. As the need for non-white

transport grows and the complexity of operating such a service increases, the setting up of an autonomous transport administration will become essential. This, of course, means extra capital outlay and to the generally conservative municipal authorities may appear unattractive. It is nevertheless necessary if each operation is to perform efficiently - whether at a profit or not.

CONCLUSIONS

The necessity for public transportation must inevitably give rise to conflict between economic and non-economic considerations. However, in the author's opinion it is perhaps preferable that emphasis is placed on economic variables, as in the long run economic viability is the only way to satisfy non-economic aims. Those services with too large a social conscience will experience a continual liquidity squeeze, and the resulting underinvestment in facilities will inexorably lead to poor transport for poor people. In the instance where mass transportation is provided for an essentially low income group, subsidisation by the state, however, is perhaps the only means by which such services can be continued. On the other hand, it is imperative that the state does not subsidise efficiency or a pricing structure which is too low. While it may to a certain extent be true that public transport is a naturally depressed industry, it may also be just as true that lack of efficiency is more responsible for poor financial results than any natural market force.

ANNEXURE A

QUESTIONNAIRE CONDUCTED IN GRAHAMSTOWN

1. The total sample consisted of 158 employers or potential employers of Bantu labour.
2. The interviewing was done on a door-to-door basis to avoid the complications arising from postal or telephonic methods. In this way the entire population sample was reached and interviewed.
3. Testing of the questionnaire was done on a sample of 10 respondents whose replies were not used in the final analysis.
4. The results obtained from the questionnaire were formalised at 2 standard errors (a confidence coefficient of 95%), apart from those where the confidence interval at this level was greater than 20% in which case 1 standard error was used (a confidence coefficient of 68%). The formula applied to calculate the standard error was that used for proportion sampling :

$$\sigma = \sqrt{\frac{P \times Q}{N}}$$

Where :

σ = standard error

P = that percentage of the sample which responded positively to any question

Q = that percentage of the sample which responded negatively to any question

N = sample size for any particular question.

5. To avoid the necessity for stratification, the sampling was carried out as follows :

- A) 107 respondents were residents outside the Central Business District (C.B.D.). The results obtained from this section of the sample were, therefore, only applicable to domestic labour. Respondents were chosen on the basis of one house randomly selected from every second block of housing. In this way, no undue influence could be exerted by any section of the residential area.

All interviewing was carried out between 5.30 p.m. and 9.00 p.m. If any potential respondent was not at home during this time, one further attempt was made to contact him/her between the same hours some other day before a new sample was taken from that block.

On occasions when employers were unable to answer questions pertaining to their employees, permission was asked to return during working hours the next day to obtain such answers from the employees themselves. In this way, the response rate to almost all questions was 100%.

The 107 employers interviewed represented a total of 134 employees.

- B) A total of 51 respondents were selected from the C.B.D. itself (representing 989 employees). Educational institutions were included in this section of the total sample. The results obtained here can, therefore, only be related to the industrial, commercial and educational sectors of Grahamstown.

The format of the questionnaire used, together with the number of people making the various alternative responses, is given on page (iii). +

+ It is important to remember that certain questions pertain to the number of employers interviewed, while others pertain to the number of employees they represent. For convenience, the relevant number is stated after each question.

Question 1

"Do you employ any Bantu labour, whether part time or full time?"

A) Residential area (Employers - 107)

Yes 100

No 7

% of respondents employing Black labour = 93%

σ = 2,55%

Standard errors = 2

Confidence interval = 87,9% - 98,1%

Confidence coefficient = 95%

B) C.B.D. (Employers - 51)

Yes 50

No 1

% of respondents employing Black labour = 98%

σ = 1,98%

Standard errors = 2

Confidence interval = 94,04% - 100,00%

Confidence coefficient = 95%

Question 2 (Not applicable to C.B.D. sample)

"Does he/she/they reside on the premises?"

A) Residential area (Employees - 134)

Yes 14

No 120

% of employees not residing on the premises = 90%

 $\sigma = 2,59\%$

Standard errors = 2

Confidence interval = 84,82% - 95,18%

Confidence coefficient = 95%

Question 3 (Not applicable to C.B.D. sample)

"If any employee does reside on the premises, how often does he/she/they leave the premises on days off? How does he/she/they travel?"

A) Residential area (Employees - 14)

DAYS OFF PER WEEK	LEAVES PREMISES	NO. OF TIMES TRAVELS BY -
0 Days 0	0 Times 1	Bus 9
$\frac{1}{2}$ Day 3	1 Time 11	Walks 5
1 Day 7	2 Times 2	Other 1
$1\frac{1}{2}$ Days 4		
2 Days 0		

Sample too small for analysis.

Question 4

"If any employee does not reside on the premises, how does he/she/they get to work?"

A) Residential area (Employees - 120)

Bus 112

Walk 6

Other 2

% of employees using the bus service = 93%

$\sigma = 2,33\%$

Standard errors = 2

Confidence interval = 88,34% - 97,66%

Confidence coefficient = 95%

B) C.B.D. (Employees - 989)

Bus 867

Walk 96

Other 26

% of employees using the bus service = 87%

$\sigma = 1,07\%$

Standard errors = 2

Confidence interval = 84,86% - 89,14%

Confidence coefficient = 95%

Question 5

"If any employee uses the bus service to get to work, is the fare paid by you, by him/her/them or partly by you and partly by him/her/them?"

A) Residential area (Employers - 78)

By you (employer)	24
By him/her/them (employees)	48
Partly by you & partly by him/her/them	6

% of employees paying bus fares for employees = 31%

$\sigma = 5,2\%$

Standard errors = 1

Confidence interval = 25,8% - 36,2%

Confidence coefficient = 68%

B) C.B.D. (Employers - 43)

By you (employer)	4
By him/her/them (employees)	38
Partly by you & partly by him/her/them	1

% of employees paying bus fares for employees = 9%

$\sigma = 3,05\%$

Standard errors = 2

Confidence interval = 2,9% - 15,1%

Confidence coefficient = 95%

Question 6

"If you (the employer) pay your employees' transport bill, do you feel the present rates are too low, tolerable or too high?"

A) Residential area (Employers - 24)

Too low 2
 Tolerable 21
 Too high 1

% of respondents who consider present rates tolerable = 88%

$\sigma = 6,63\%$

Standard errors = 1

Confidence interval = 81,37% - 94,63%

Confidence coefficient = 68%

B) C.B.D. (Employers - 4)

Too low 0
 Tolerable 4
 Too high 0

Sample too small for analysis.

Question 7

"If you (the employer) pay for your employees' bus fare, would you still be prepared (or feel obliged) to do so if fares were increased by (i) 50% (ii) 100%?"

A) Residential_area (Employers - 24)

1. 50%

Yes 22

No 2

2. 100%

Yes 22

No 2

% of respondents prepared to pay for 50% and 100% increase in fare price = 92%

 $\sigma = 5,54\%$

Standard errors = 1

Confidence interval = 86,46% - 97,54%

Confidence coefficient = 68%

B) C.B.D. (Employers - 4)

1. 50%

Yes 4

No 0

2. 100%

Yes 4

No 0

Sample too small for analysis.

Question 8

"If you (the employer) do not pay your employees bus fare, would you be prepared (or feel obliged) to increase your employees wage by the full, or some proportionate amount of a fare increase of (i) 50% (ii) 100%?"

A) Residential area (Employers - 54)

1. 50%

Yes 33

No 21

2. 100%

Yes 31

No 23

% of respondents prepared to pay for 50% increase in fare prices = 61%

$\sigma = 6,64\%$

Standard errors = 1

Confidence interval = 54,36% - 67,64%

Confidence coefficient = 68%

B) C.B.D. (Employers - 38)

1. 50%

Yes 6

No 32

2. 100%

Yes 6

No 32

% of respondents prepared to pay for 50% and 100% increase in fare prices = 16%

$\sigma = 5,95\%$

Standard errors = 1

Confidence interval = 10,05% - 21,95%

Confidence coefficient = 68%

Question 9 (Not applicable to C.B.D. sample)

"Do your employees travel on season tickets?"

A) Residential area (Employees - 112)

Yes 21

No 91

% of employees travelling on season tickets = 19%

$\sigma = 3,71\%$

Standard errors = 2

Confidence interval = 11,58% - 26,42%

Confidence coefficient = 95%

Question 10

"Do you, the employer, feel that the quality of the bus service is good, indifferent, poor or don't you know?"

A) Residential area (Employers - 86)

Good 6

Indifferent 56

Poor 10

Don't know 14

% of respondents who feel the service is good = 7%

$\sigma = 2,75\%$

Standard errors = 2

Confidence interval = 1,5% - 12,5%

Confidence coefficient = 95%

% of respondents who feel the service is poor = 12%

$\sigma = 3,5\%$

Standard errors = 2

Confidence interval = 5% - 19%

Confidence coefficient = 95%

B) C.B.D. (Employers - 43)

Good 2

Indifferent 14

Poor 1

Don't know 26

% of respondents who feel the service is good = 5%

$\sigma = 3,32\%$

Standard errors = 1

Confidence interval = 1,68% - 8,32%

Confidence coefficient = 68%

% of respondents who have no idea of the quality of the service = 61%

$\sigma = 7,44\%$

Standard errors = 1

Confidence interval = 53,56% - 68,44%

Confidence coefficient = 68%

Question 11

"The following are some complaints lodged against the Grahamstown Municipal Bus Service, which of them apply to your employees?"

A) Residential and C.B.D. areas (Employees - 96)

(i) Overcrowding

Never 2

Occasionally 21

Frequently 42

Always 31

% of respondents who never find buses overcrowded = 2%

$\sigma = 1,41\%$

Standard errors = 1

Confidence interval = 0,59% - 3,41%

Confidence coefficient = 68%

% of respondents who always find buses overcrowded = 32%

$\sigma = 4,76\%$

Standard errors = 2

Confidence interval = 22,48% - 41,52%

Confidence coefficient = 95%

(ii) The nearest bus stop is far from your place of employment

Yes 22

No 74

% of respondents who feel the nearest bus stop is far from place
of employment = 23%

$\sigma = 4,29\%$

Standard errors = 2

Confidence interval = 14,42% - 31,58%

Confidence coefficient = 95%

(iii) The trip takes too long

Yes 12

No 84

% of respondents who feel the trip takes too long = 13%

$\sigma = 3,43\%$

Standard errors = 2

Confidence interval = 6,41% - 19,86%

Confidence coefficient = 95%

(iv) Buses running to schedule

Never 13

Occasionally 39

Frequently 36

Always 8

% of respondents who feel buses never run to schedule = 14%

$\sigma = 3,54\%$

Standard errors = 2

Confidence interval = 6,92% - 21,08%

Confidence coefficient = 95%

Question 12 (Not applicable to C.B.D. sample)

"How often do your employees use the bus service every week in order to get to work?"

A) Residential area (Employees - 112)

EMPLOYEE 1	EMPLOYEE 2	EMPLOYEE 3	TOTAL DAYS WORKED PER WEEK			
1 time 4	1 time 2	1 time 3	9	x1	9	
2 times 2	2 times 10	2 times 2	14	x2	28	
3 times 16	3 times 4	3 times -	20	x3	60	
4 times 17	4 times -	4 times -	17	x4	68	
5 times 36	5 times -	5 times -	36	x5	180	
6 times 14	6 times 1	6 times -	15	x6	90	
7 times 1	7 times -	7 times -	1	x7	7	
Total 90	17	5	112		442	
Average -	-	-	-		3,9	

Question 13 (Not applicable to residential area sample)

"How many days per week do your employees work?"

A) C.B.D. (Employers - 43)

1 day	0
2 days	0
3 days	0
4 days	0
5 days	6
6 days	37
7 days	0
Sample average =	5,9%

Question 14

"What is the monthly income of your employees and what form of payment in kind does he/she/they receive?"

A) Residential area (Employers - 134)

Total monies paid in wages per month = R3 622,00

Average wage per month = R27,03

PAYMENT IN KIND AS ESTIMATED BY RESPONDENTS

ITEM	NUMBER OF EMPLOYEES SUBSIDISED	AVERAGE AMOUNT PER MONTH	TOTAL	AVERAGE FOR SAMPLE
Medical	22	R 0,25	R 5,50	R ,05.5 cents
Rent	7	1,50	10,50	,10.5 cents
Food	94	12,00	1 128,00	11,28
Uniforms	63	0,25	15,75	,15.75 cents
Savings	2	2,00	4,00	,04 cents
Childrens Education	6	2,00	12,00	,12 cents
Transport	32	2,25	72,00	,54 cents
TOTAL	-	-	-	R12,30

B) C.B.D. / (xv)

B) C.B.D. (Employees - 989)

Average wage as estimated by employers = R79,00

Payment in kind negligible

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A N N E X U R E B

The existing routes covered by the
Grahamstown Municipal Bus Service

KEY

Route A 

Route B 

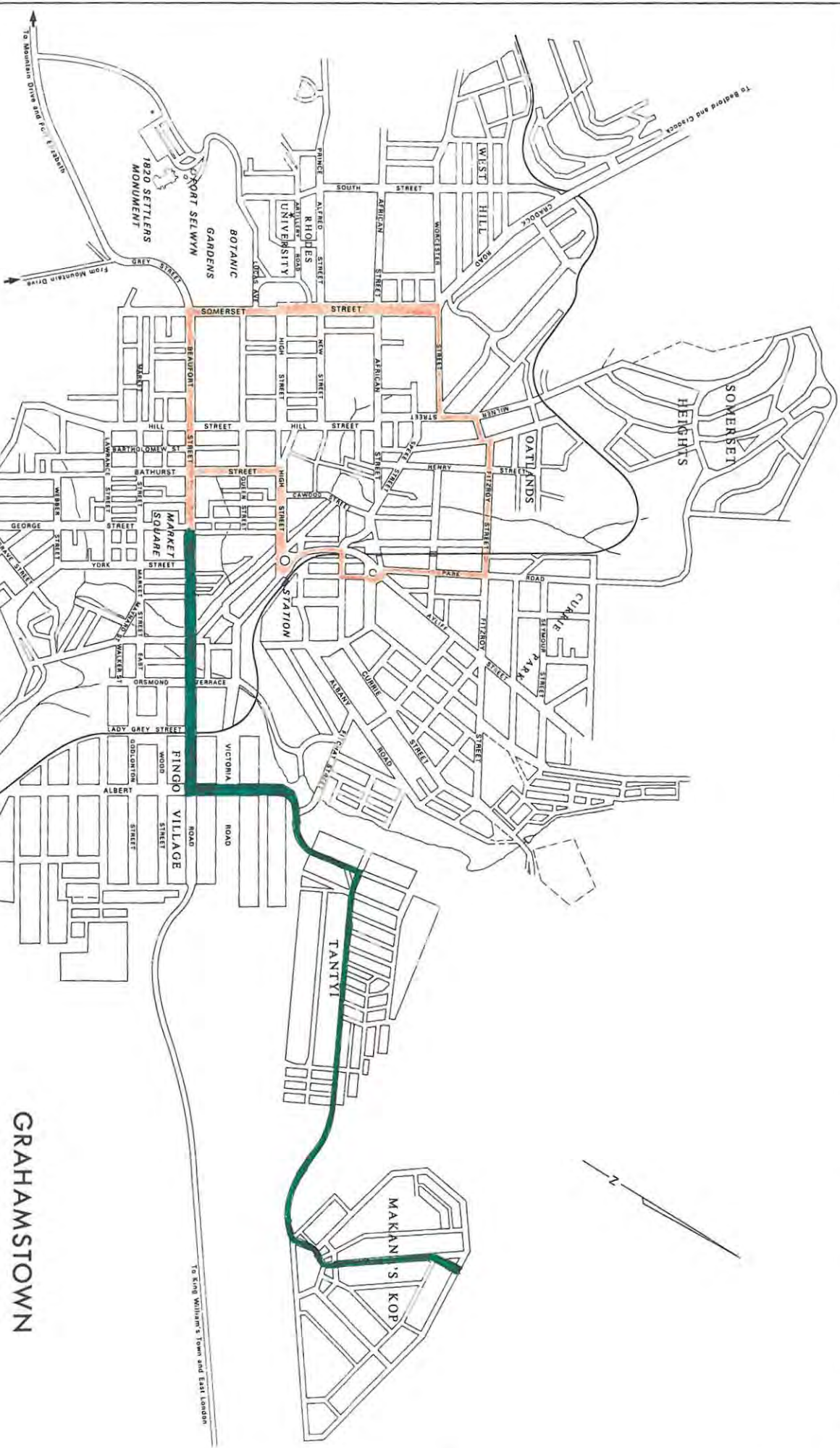
ANNEXURE C

The recommended routes to be covered by the
Grahamstown Municipal Bus Service

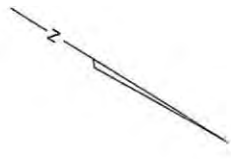
KEY

Route A 

Route B 



GRAHAMSTOWN



To King William's Town and East London

To Mountain Drive and R102

To Bedford and Clocol

