

**FARE POLICIES:  
A TOOL FOR IMPROVING THE  
FINANCIAL PERFORMANCE OF  
MALAYAN RAILWAY**

**WAN MADZNAH WAN IBRAHIM**

*Master of Philosophy*

**UNIVERSITY OF ASTON IN BIRMINGHAM**

November 1990

This copy of the thesis has been supplied on condition that anyone who consults it is understood to recognise that its copyright rests with its author and that no quotation from the thesis and no information derived from it may be published without the author's prior, written consent.



# THE UNIVERSITY OF ASTON IN BIRMINGHAM

## FARE POLICIES: A TOOL FOR IMPROVING THE FINANCIAL PERFORMANCE OF MALAYAN RAILWAY

*Wan Madznah Wan Ibrahim*  
*M.Phil 1990*

### THESIS SUMMARY

This thesis is concerned with improvement of Malayan Railway revenue performance through a fare policies approach utilising the elasticity of demand concept. The latter is developed, albeit experimentally, beyond the rudimentary framework of most previous transportation studies. Its application to MR is opportune, since MR finds itself trapped between Government pressure to become self-sustaining through profitability rather than depend upon subsidies, and its enforced exclusion from taking market-orientated decisions for optimising operational efficiency.

The thesis examines relationships between changing fares and changing demand, using the concept of elasticity. Data currently available in MR is proved inadequate for the in-depth analyses required to obtain a realistic elasticity estimate for any service. Analysis of studies of other railway systems contributes to providing a range of elasticity estimates for MR. These are used to simulate both a series of percentage fare increases in selected services, with resultant changes in demand and their revenue effects; hence the viable range of options open to MR in the proposed fare experiment. The passenger opinion surveys are used in order to determine the actual characteristics of MR services and their passengers. They also provide guidelines for trying out SP methods in the Malaysian context by taking into account the costs and the cultural problems.

The study concludes that MR needs to take specific action in order to improve its financial position – in this case to implement an experimental series of fare changes in selected services for about one year. In order to forecast demand and refine elasticity estimates, regular surveys of existing and potential passengers are suggested, using both revealed and stated preference methods for analysis. It follows that Government needs to delegate more decision-power to MR management, allowing it greater freedom to adopt measures aimed at increasing profitability in its services. At the same time, it is hoped that greater responsibility, commitment and productivity will thereby be encouraged among existing MR personnel.

### KEYWORDS:

Malaysia, Railway, Fare-Setting, Elasticity, Revenue-Improvement



## ACKNOWLEDGEMENTS

So many kind people have provided me with guidance, advice and facilities for completion of research and writing-up my thesis, including its final presentation, that to mention them all might take many pages. May I simply say to all of them a most sincere "thank you".

Yet there are some whose names really must be mentioned: in Malaysia, I refer to Professor Hamzah Ismail of the National University, and to Mr Rahim Osman, First Deputy Manager, Malayan Railway, without whose assistance my project could not have begun; likewise to my sponsors, the Government of Malaysia and the National University of Malaysia.

In Britain, I owe a big debt of gratitude to my supervisor Mr John Watt at Aston University for his perspicacious and constructive encouragement throughout. I am also grateful to Dr C A Nash at the University of Leeds, and to Mr Peter White, at the Polytechnic of Central London, for time spent together discussing in detail the concept of elasticity in transport research studies.

Comments thankfully received from peers and colleagues on the Aston University Doctoral Programme have also proved of practical help. Warm thanks for her long efforts are especially due to my typist, Diane Stretton, who transcribed my sometimes chaotic notes into an immaculate presentation.

Last but by no means least – may I return to my dear husband, Raouf Al-Samarraie and our children as much as possible of all the love and support they have provided for me during this long study. This thesis I hereby dedicate to them, with deepest gratitude for their sacrifice.



## TABLE OF CONTENTS

|                    |    |
|--------------------|----|
| Thesis Summary     | 2  |
| Acknowledgements   | 3  |
| List of Contents   | 4  |
| List of Tables     | 9  |
| List of Figures    | 11 |
| List of Appendices | 12 |

### List of Contents

#### Chapter One: Introduction

|     |                                          |    |
|-----|------------------------------------------|----|
| 1.1 | Introduction                             | 13 |
| 1.2 | Purpose of the Study                     | 13 |
| 1.3 | Other Possible Alternatives              | 15 |
| 1.4 | The Scope of the Study                   | 17 |
| 1.5 | Methodology                              | 18 |
| 1.6 | Limitations                              | 19 |
| 1.7 | Summary of Research Process and Outcomes | 21 |
| 1.8 | Contribution                             | 22 |
| 1.9 | Thesis Structure                         | 24 |

#### Chapter Two: Background

|         |                                                    |    |
|---------|----------------------------------------------------|----|
| 2.1     | Malaysia                                           | 26 |
| 2.1.1   | Geographical Setting                               | 26 |
| 2.1.2   | Historical Perspective                             | 27 |
| 2.1.3   | The Role of Transportation in National Development | 27 |
| 2.1.4   | Government Financial Allocation for Transport      | 30 |
| 2.2     | Malayan Railway (MR) - Keretapi Tanah Melayu       | 32 |
| 2.2.1   | History from 1886                                  | 32 |
| 2.2.2   | MR Organisation                                    | 34 |
| 2.2.2.1 | MR Administration                                  | 36 |
| 2.2.3   | MR System                                          | 37 |
| 2.2.4   | MR Objectives                                      | 39 |
| 2.2.4.1 | General Objectives                                 | 39 |
| 2.2.4.2 | Service Objectives                                 | 39 |
| 2.2.5   | MR in National Development                         | 40 |
| 2.2.6   | Financial Aid from the Government                  | 43 |



|       |                                           |    |
|-------|-------------------------------------------|----|
| 2.3   | Malayan Railway Operation and Performance | 45 |
| 2.3.1 | Context                                   | 45 |
| 2.3.2 | Freight Traffic in General                | 46 |
| 2.3.3 | Passenger Traffic                         | 47 |
|       | 2.3.3.1 Type of Service                   | 47 |
|       | 2.3.3.2 Passenger Traffic Performance     | 49 |
|       | 2.3.3.3 Passenger Tariff                  |    |
| 2.3.4 | Financial Performance                     | 54 |
| 2.3.5 | Traffic Forecast                          | 56 |
| 2.4   | Conclusion                                | 59 |

### **Chapter Three: Methodology and Sources of Data**

|     |                                                                   |     |
|-----|-------------------------------------------------------------------|-----|
| 3.1 | Introduction                                                      | 61  |
| 3.2 | Grounded approach                                                 | 63  |
| 3.3 | Background to Approach and Methods                                | 71  |
|     | 3.3.1 Nature of problems                                          | 71  |
|     | 3.3.2 Fare Revisions Process                                      | 73  |
|     | 3.3.3 Statement of suitability of adopted procedures              | 74  |
| 3.4 | Data Sources                                                      | 75  |
|     | 3.4.1 Literature search - aims and summary                        | 75  |
|     | 3.4.2 Interviews with established researchers                     | 82  |
|     | 3.4.3 Documented data                                             | 82  |
|     | 3.4.4 Interviews with personnel                                   | 84  |
|     | 3.4.5 Survey                                                      | 85  |
|     | 3.4.5.1 Population and sample                                     | 87  |
|     | 3.4.5.2 Questionnaire design                                      | 90  |
|     | 3.4.5.3 Pre-test, revision and final draft                        | 90  |
|     | 3.4.5.4 Communication method, interviews and training             | 91` |
| 3.5 | Estimate of bias, reliability and suggested means of verification | 94  |
| 3.6 | Analysis                                                          | 97  |
|     | 3.6.1 Economic analysis                                           | 97  |
|     | 3.6.2 Experiment proposal                                         | 100 |
| 3.7 | Conclusion                                                        | 102 |



## Chapter Four: Data Analysis

|       |                                  |     |
|-------|----------------------------------|-----|
| 4.1   | Introduction                     | 105 |
| 4.2   | Costs                            | 106 |
| 4.2.1 | Definition                       | 106 |
| 4.2.2 | Cost Structure                   | 107 |
| 4.2.3 | Rate - making in MR              | 109 |
| 4.3.  | Survey Analysis                  | 112 |
| 4.3.1 | Analysis by questions            | 114 |
| 4.3.2 | Analysis Summary                 | 124 |
| 4.4   | Rate of occupancy data           | 127 |
| 4.4.1 | Data Analysis                    | 127 |
| 4.5   | MR data on passenger numbers     | 133 |
| 4.6   | Elasticity range from literature | 138 |
| 4.7   | Conclusion                       | 140 |

## Chapter Five: Fare Elasticity of Demand in Transportation

### *Part One – The Concept* 144

|       |                                                          |     |
|-------|----------------------------------------------------------|-----|
| 5.1   | Introduction                                             | 144 |
| 5.2   | Price, demand and elasticity                             | 145 |
| 5.3   | Type of elasticity                                       | 149 |
| 5.3.1 | Income elasticities                                      | 149 |
| 5.3.2 | Cross elasticities                                       | 150 |
| 5.3.3 | Direct price elasticities                                | 150 |
| 5.4   | The determinants of price elasticity of demand           | 152 |
| 5.5   | Price elasticity of demand                               | 154 |
| 5.5.1 | Point price elasticities                                 | 154 |
| 5.5.2 | Arc price elasticity                                     | 158 |
| 5.5.3 | Shrinkage ratio                                          | 161 |
| 5.6   | Elasticity and total revenue                             | 162 |
| 5.7   | Collecting data to estimate elasticities                 | 165 |
| 5.8   | Evidence from the application of elasticities concept    | 169 |
| 5.8.1 | Evidence from transit operating statistics               | 170 |
| 5.8.2 | Evidence from the analysis of operating data time series | 170 |
| 5.8.3 | Evidence from transit demonstration projects             | 171 |
| 5.8.4 | Evidence from cross-section models of modal choice       | 171 |

|     |            |     |
|-----|------------|-----|
| 5.9 | Conclusion | 179 |
|-----|------------|-----|

## *Part Two – Introducing elasticities in MR* 182

|        |                                              |     |
|--------|----------------------------------------------|-----|
| 5.10   | Introduction                                 | 182 |
| 5.11   | 'Before and after' analysis                  | 183 |
| 5.12   | Elasticities grouping                        | 185 |
| 5.12.1 | Time Period                                  | 186 |
| 5.12.2 | Journey purpose related to demand elasticity | 186 |
| 5.12.3 | Passenger personal factors                   | 187 |
| 5.13   | Elasticities estimation                      | 187 |
| 5.14   | Fare determination                           | 192 |
| 5.15   | Conclusion                                   | 193 |

## **Chapter Six: Experimentation with Fare Elasticity of Demand in MR**

### *Part One – Background* 195

|       |                                |     |
|-------|--------------------------------|-----|
| 6.1   | Introduction                   | 195 |
| 6.2   | Reasons for experiment         | 196 |
| 6.3   | Strategies                     | 197 |
| 6.4   | Monitoring requirements        | 198 |
| 6.5   | Simulation and risk management | 200 |
| 6.5.1 | Times                          | 201 |
| 6.5.2 | Fare changes                   | 202 |
| 6.5.3 | Simulation process             | 206 |
| 6.5.4 | Simulation result              | 207 |

### *Part Two – Analysis of 1990 surveys* 215

|       |                                                                     |     |
|-------|---------------------------------------------------------------------|-----|
| 6.6   | Revealed preferences methods and modified stated preference methods | 215 |
| 6.6.1 | Sample                                                              | 215 |
| 6.6.2 | Questionnaire                                                       | 216 |
| 6.6.3 | Interview                                                           | 217 |
| 6.6.4 | Analysis and interpretation                                         | 217 |
| 6.7   | Trade-off method in SP fare experiment                              | 226 |
| 6.7.1 | Background                                                          | 226 |
| 6.7.2 | SP survey in March 1990                                             | 228 |



|                                                 |                                               |     |
|-------------------------------------------------|-----------------------------------------------|-----|
| 6.7.2.1                                         | Data collection procedure                     | 228 |
| 6.7.2.2                                         | Data collection instrument                    | 231 |
| 6.7.2.3                                         | Analysis of data                              | 231 |
| 6.7.2.4                                         | Limitations                                   | 233 |
| 6.7.2.5                                         | Conclusion                                    | 234 |
| <i>Part Three – Experimental proposal</i>       |                                               | 236 |
| 6.8                                             | Feasibility study of the experiment           | 236 |
| 6.8.1                                           | The objectives of the experiment              | 237 |
| 6.8.2                                           | Timing the experiment                         | 239 |
| 6.8.3                                           | Data from MR statistics                       | 240 |
| 6.8.4                                           | Survey                                        | 241 |
| 6.8.5                                           | Research instrument – questionnaire           | 242 |
| 6.8.6                                           | Sample                                        | 244 |
| 6.8.7                                           | Survey findings                               | 246 |
| 6.8.8                                           | Research team options                         | 249 |
| 6.8.9                                           | Cost of the survey                            | 254 |
| 6.9                                             | Decision-taking                               | 258 |
| 6.10                                            | Operational plan                              | 259 |
| 6.11                                            | Setting the fare                              | 262 |
| 6.12                                            | Conclusion                                    | 263 |
| <b>Chapter Seven: Implications of the Study</b> |                                               |     |
| 7.1                                             | Introduction                                  | 265 |
| 7.2                                             | Elasticity concept as a method of measurement | 265 |
| 7.3                                             | Meso-Economic considerations                  | 269 |
| 7.4                                             | Benefits from computer simulation             | 271 |
| 7.5                                             | MR management in the future                   | 274 |
| 7.6                                             | Further tasks towards improvement             | 276 |
| 7.7                                             | Conclusion                                    | 277 |
| <b>Chapter Eight: Conclusion</b>                |                                               |     |
| 8.1                                             | Introduction                                  | 279 |
| 8.2                                             | Overall Conclusions                           | 280 |
| 8.3                                             | Pointers to Future Applications               | 286 |
| List of References                              |                                               | 289 |
| List of Appendices                              |                                               |     |

## LIST OF TABLES

### CHAPTER TWO

|     |                                                                                               |    |
|-----|-----------------------------------------------------------------------------------------------|----|
| 2.1 | Financial allocation for transport in West Malaysia                                           | 31 |
| 2.2 | Government loans and grants to MR, 1956-1985                                                  | 44 |
| 2.3 | MR percentage of passenger traffic of the three classes of service 1982-1986                  | 50 |
| 2.4 | MR breakdown of the percentage of passenger revenue from 2nd and 3rd class services 1982-1986 | 51 |
| 2.5 | MR financial assessment, 1982-1986                                                            | 54 |
| 2.6 | MR Passenger, freight and parcel/mail revenue 1982-1986                                       | 56 |
| 2.7 | MR freight traffic forecast 1986-1990                                                         | 57 |
| 2.8 | MR passenger traffic forecast 1986-1990                                                       | 58 |
| 2.9 | MR parcel and mail revenue forecast 1986-1990                                                 | 58 |

### CHAPTER FOUR

|      |                                                                                                    |     |
|------|----------------------------------------------------------------------------------------------------|-----|
| 4.1  | MR survey-opinion on fare and quality of service - train compared to other modes - September 1987  | 123 |
| 4.2  | MR survey - summary of overall opinion on train service                                            | 124 |
| 4.3A | Average rate of occupancy according to time (% rate of all types of service)                       | 130 |
| 4.3B | Average rate of occupancy according to service type and class (% rate of every class)              | 131 |
| 4.4  | MR percentage of passenger journey according to ticket type in Northbound and Southbound 1984-1986 | 134 |



|     |                                                                                                               |     |
|-----|---------------------------------------------------------------------------------------------------------------|-----|
| 4.5 | MR mainline percentage of passenger journey and revenue according to ticket type for 1984 to half 1987        | 135 |
| 4.6 | MR fares for the ordinary and express services for Butterworth - Kuala Lumpur and Kuala Lumpur - Johore Bharu | 137 |

#### *CHAPTER FIVE*

|     |                                                                       |     |
|-----|-----------------------------------------------------------------------|-----|
| 5.1 | MR fare elasticity of 1984 fare changes according to class of service | 184 |
| 5.2 | MR elasticities estimation according to time period                   | 191 |
| 5.3 | MR elasticities estimation according to service                       | 192 |

#### *CHAPTER SIX*

|        |                                                                                         |     |
|--------|-----------------------------------------------------------------------------------------|-----|
| 6.1    | Time and elasticity estimates                                                           | 202 |
| 6.2    | Elasticity ranges according to ticket type and fare changes                             | 203 |
| 6.3    | Elasticity ranges and percentage of fare changes according to ticket types and times    | 206 |
| 6.4    | Simulation result of MR present and forecast revenues using different elasticity values | 208 |
| 6.5    | Summary analysis of expected total revenue from the fare experiment                     | 212 |
| 6.6    | Preferred class chosen by six samples in February survey 1990                           | 223 |
| 6.6(a) | The most preferred class by six samples                                                 | 223 |
| 6.6(b) | The most preferred service by six samples                                               | 224 |
| 6.6(c) | Number of first choice according to class                                               | 224 |
| 6.6(d) | Number of first choice according to service                                             | 225 |
| 6.7    | The rail attributes and level to be considered                                          | 243 |

## LIST OF FIGURES

### *CHAPTER TWO*

|     |                           |    |
|-----|---------------------------|----|
| 2.1 | Malayan railway line 1987 | 33 |
| 2.2 | Organisation chart of MR  | 38 |

### *CHAPTER THREE*

|     |                                                         |    |
|-----|---------------------------------------------------------|----|
| 3.1 | Sources of data and statigic description of methodology | 65 |
| 3.2 | Demand curve                                            | 98 |

### *CHAPTER FIVE*

|     |                                                                                         |     |
|-----|-----------------------------------------------------------------------------------------|-----|
| 5.1 | Demand curve                                                                            | 146 |
| 5.2 | Demand curve and point elasticity                                                       | 155 |
| 5.3 | Demand curve and arc price elasticity, mid-point price elasticity and linear elasticity | 159 |
| 5.4 | Elasticity estimate according to time (9 categories)                                    | 189 |
| 5.5 | Elasticity estimate according to service (14 categories)                                | 189 |

### *CHAPTER SIX*

|     |                                     |     |
|-----|-------------------------------------|-----|
| 6.1 | Experimental phases/survey schedule | 241 |
|-----|-------------------------------------|-----|



## LIST OF APPENDICES

|     |                                                                                                                                         |     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------|-----|
| A   | West Malaysia (major) road and highway network 1987                                                                                     | 301 |
| B   | Malayan Railway network development 1886 to 1931                                                                                        | 302 |
| C   | Passenger and freight traffic growth                                                                                                    | 303 |
| D-1 | Income and expenditure accounts of MR 1982-1986                                                                                         | 304 |
| D-2 | Balance sheet of MR 1982-1986                                                                                                           | 305 |
| E   | Questionnaire for survey in September 1987                                                                                              | 306 |
| E-1 | <i>Soalselidik bagi survey September 1987</i>                                                                                           | 319 |
| F-1 | Occupancy rate of passenger service 1987 (NB)                                                                                           | 342 |
| F-2 | Occupancy rate of passenger service 1987 (SB)                                                                                           | 347 |
| G   | Abstracts of previous works on fare elasticity demand estimates                                                                         | 352 |
| H-1 | Compilation of work on the elasticity ranges for urban service 1970-1988                                                                | 358 |
| H-2 | Compilation of work on the elasticity ranges for inter-urban service 1970-1980                                                          | 361 |
| I   | Basic program for simulation process on demand and revenue forecast                                                                     | 362 |
| J   | West coast of West Malaysia fare and journey time of rail, road and air transport between major towns in 1987                           | 363 |
| K   | Questionnaire for the survey in MR's fare experiment – February 1990                                                                    | 365 |
| K-1 | <i>Soalselidik Bagi Kajian Untk Eksperimen Kenaikan Tambang KTM - Februari 1990</i>                                                     | 370 |
| L   | Questionnaire for Malayan Railway fare experiment study using stated preference approach, March 1990                                    | 378 |
| L-1 | <i>Soalselidik Untuk Kajian Eksperimen Tambang Perkhidmatan Tambang KTM Dengan Menggunakan Pendekatan 'Stated Preference', Mac 1990</i> | 383 |
| M-1 | Letter of approval from the acting Manager of MR                                                                                        | 390 |
| M-2 | A newspaper cutting on MR's new development plan                                                                                        | 391 |
| N   | Names and addresses of the panels for second interview                                                                                  | 392 |

# **CHAPTER ONE**

## **INTRODUCTION**

### **1.1 Introduction**

This chapter commences with an outline of the key issue to be addressed by the current research thesis. In summary, this is to promulgate a fare model (or models) suitable for Malayan Railway (MR) and its passenger market, to be introduced and refined in the proposed experimental stage of implementation. The model(s) should facilitate the possibility of increasing net revenue through fare structure manipulation. An examination of the existing literature shows that no previous work in public transportation has systematically attempted to use elasticity estimates in ranges, in order to forecast the revenue arising from a defined schedule of fare changes.

Other sections of this chapter briefly describe the scope of this study, the methodology used and its limitations, possible alternative solutions to MR's problem; a summary of the chosen research process and its outcome; and a concluding section guiding the reader about the layout of the thesis.

### **1.2 Purpose of the Study**

The major aim of this work is to find the best fare structure for improving MR's revenue via the elasticity of demand concept. This aim is operationalised by means of an experiment with fare changes which it is proposed should be carried out over a period of twelve months in the very near future, sometime in 1991.



An experiment is seen to be the best practical way to assess the usefulness, constraints and risks in reality of the elasticity of demand concept, before total implementation as an MR operating procedure and because of the practical impossibility of prior calculation of elasticities.

The minor aim of this study is to impress the government sufficiently to oblige them to consider delegating more policy-making power to MR. It follows that by having more freedom to operate like other commercial business organisations, which are market - orientated, MR should become fully responsible for the loss and profit resulting from their operations. At the same time, incentive would then exist for MR management and employees to become committed and productive.

The ultimate nub of this intention is to show to the government via MR itself that there is space for this organisation to improve its financial viability without further subsidy, simply by using its present resources more efficiently - provided always that there is given to MR more freedom in which to progress. This idea arose directly from the observation and experience of the researcher and through conversations with senior management in MR.

The main reason why the researcher selected the approach adopted in this thesis was the self-evident need of MR to update its strategy without incurring either large expenditures or risking further loss of revenue. Although MR have agreed in principal to consider the experimental proposal when it is presented to them by the researcher, it is important to bear in mind that successive general managers may well consider it differently, or even the same manager may change his mind due to such exterior considerations as expense, disruption, public reaction to change, etc. So MR does not feel bound under all conditions to implement this proposal. However, MR have provided the encouraging



clue that should this study parallel their actual need and interest, then the possibility of acceptance and implementation is high.

### **1.3 Other Possible Alternatives**

Other possible ways exist by which MR could attempt to overcome their operational loss problem. Closing down 'uneconomic' services on certain branch lines is one of them, especially if the government becomes reluctant to subsidise these losses in full. Savings on overheads previously incurred in those services can be transferred to improve the accounting balances and quality of service on proven higher revenue - producing main line services.

Thousands of hectares of land are owned by MR along the present track which will allow them one day to build a second track with electrification between main urban areas, like Port Klang - Kuala Lumpur, Seremban - Kuala Lumpur and Ipoh - Kuala Lumpur. This will enable MR to cater for commuting services which at the same time will help solve housing problems in Kuala Lumpur. The big question here, is whether government is willing and able to arrange finance –perhaps for the first time allowing MR a large borrowing facility from the open market. A relatively small sum would be needed in order to carry out a feasibility study, which could lead to realisation of plans for a second track at a later date.

On the other hand, the pace and character of present and projected national development indicates that more rather than fewer local services will be needed. Furthermore, the demand for third class service is already high, but because its fare is set at a low level, so less revenue is earned thereby. This is again related to government policy - even in advanced industrial countries, government feels the need to subsidise fares on public transport for the benefit of poorer sections of the population - usually by means of direct



financial allocation to the operators. As already stated, this is a major root of MR management's financial and administrative problems.

Giving weight to the needs for more local services may paradoxically encourage MR to embark on a series of service and quality improvements on the better frequented services showing good revenue contributions. By increasing the satisfaction and profit in the busiest areas, additional revenue becomes available for up-grading all parts of the network.

If MR were to ignore its social obligations to subsidise particular services, and chose not to differentiate between services in its utilisation of either capital stock or revenue, it could still embark upon a commercially aggressive fare-setting policy aimed at offering the public 'unbeatable fares' on all of its services. This would attract back onto rail a number of those travellers hitherto prevented mainly by reason of the fares being excessive or uncompetitive.

In other words, capacity utilisation could be improved by a well - promoted competitive fare structure, which later on could be raised once more as a greater revenue contribution enabled the quality of service to be improved : a virtuous circle, or upward spiral, could thus become established.

Even in this extreme case, it would prove useful to MR management not to act blindly but to know in advance an estimate of the risk of short-term and long-term fare increases in terms both of passenger demand and revenue contribution. In fact, whatever policy is pursued, MR appear today to need to come to grips with their market as a matter of urgency.

#### **1.4 The Scope of the Study**

The passenger section of MR, particularly the West-coast line (main-line) is selected as the focus of this thesis. This section of the system is chosen since it operates from Butterworth, in the North, to the Republic of Singapore, in the South, with two main differentiations of service offered - normal and express - whereas the East-coast line only offer normal service (twice a day mail train, and a couple of short-distance local trains daily).

The main line passes through many big administrative towns (state capitals) and industrial areas, thus offering a varying spectrum of markets for both investigation and estimates of projected fare elasticities of demand. MR data (statistics) used in this study covered 1982 to 1987.

Although the study concentrates on MR's fare structure, since this is also a policy issue (fare policy), one cannot help but relate it to other government policies bearing on the situation, particularly the statutory relationship which exists and which affects the management and the whole 'modus operandi' of MR.

The MR situation appears to be one where no single organisation wields effective overall authority concerning commercial decision-taking, but all the participants enjoy both a statutory right and a political inclination to become involved.

Evidently, the MR case is one far removed from that of full-blooded management control; in consequence of its organisational structure, the scope for policy making is restricted,



the decisions difficult to take and often an anaemic compromise. Moreover, decisions are apt to be adopted not on commercial criteria but upon factors associated with national politics.

Meanwhile, fare setting has been undertaken at long intervals on the myopic basis of a uniform increase throughout the fare structure. The process and basis of this exercise has not been disclosed but it is thought to include out-of-date 'revealed preference' revenue data and some results from more recent studies concerning costs.

It is now many years since fares were changed; consequently, experience of both fare-setting and new fare implementation remains largely lacking or inadequate. The fare experimentation suggested here is seen as a way of trying to redress the balance through a practical method which extends the scope of MR's fare setting.

There remain several ways in which the scope of this study is additionally restricted. One instance is that of the socio-economic factors taken into account, and also their justification. The number selected for inclusion in this study was arbitrary: in the full-scale experiment, some may be excluded, some included. A model could be built later on which utilises those factors proven to be significant to MR in its socio-economic setting. Thus initial restrictions of scope may be lifted in subsequent stages.

## **1.5 Methodology**

The literature review embodies the main guide to the approach of this thesis, for it is where the elasticity of demand concept is studied, analysed and adjusted. It is followed by formulation of the *ranges of* elasticity values to be used in the experimental proposal. Data and information collected from three surveys, from MR statistics, together with opinions from interviews with established transportation researchers in Britain, and

interviews with personnel in MR and other transport operators, all contributed to what is believed to be 'better - adjusted' elasticities in a developing economy. The segmented market invited classification of elasticities for each service as elastic, inelastic, or unit elastic.

## 1.6 Limitations

One of the main obstacles at the outset of this study was to obtain valid or useful information from reliable sources.

### 1. Literature

- (a) Serious communication gaps between Departments exist in MR which become evident as soon as one requests to access information, or seeks to update it. The government statistics department, too, does not possess updated data which can be used to compare between private transport ownership and public, and this in a situation where overall demand is growing. Other data are also outdated - eg. population - number, growth, age structure, income, employment, etc.
- (b) Even in Britain, the literature available on the elasticity of demand concept is extremely limited, with few recent studies reaching publication. Even less are the number of studies showing *how* their elasticity figures were calculated and for what purpose. But there does appear a new trend of applying stated preference (SP) methods, also utilising cross - elasticities\* . (see footnote).

---

\* SP studies have been collated and edited by Dr C A Nash in the Journal of Transport Economics and Policy, January 1988.



Goodwin was notable through his abstract published in June 1988, GOODWIN (1988), summarising the results of revealed preference (RP) studies (the traditional methods). But since 1980 when a collaborative study by TRRL was published, it seems that no explicit reference has been made as to exactly *how* any of the study results had been calculated or *how* the various contributing factors (causal variables) were handled. Figures given by other researchers tend to be meaningless in the context of this study eg. elasticity estimate for BR Intercity -0.3; for bus and rail services in Britain (aggregated) -0.4 – and so on as these cover wide variations between times of the day, days of the week etc.

Other limitations arise from the elasticity concept and its application. Figures cannot be taken in the strict mathematical sense, as derived in isolation from other factors from some equation or formula. One has to try to smooth successive estimates into a demand curve, discriminate according to market segment, and feed back results into the curve so as to improve its profile and make it more useful for future applications.

There remains the possibility that at the end of the exercise MR may still not be able to forecast more accurately than at present. But by using both revealed Reference (RP) and SP methods, an attempt to manipulate the real life system and to monitor **that** can be made. In this way, the organisation can undertake action learning, and devise new and better strategies.

Further limitations arise in that the elasticity estimates used in fare simulation are based on works studying established railways : these operate in differing environmental contexts in terms of geographical space, time, and the travelling habits and propensities of their passengers. Estimates used as a preliminary guide-line in this thesis are those derived



from the one-year trend of seat occupancy on MR - that of 1987. The adjustment to these estimates has been made in the light of qualitative or subjective considerations arising from the analysis of a survey of personal opinions of the travelling public and data/estimation from studies of other railways.

### **1.7 Summary of Research Process and Outcomes**

The study is focussed on revenue improvement with fare adjustments or manipulation and particularly on the means of learning how to do this process; ie. action research.

The project was tackled broadly as follows:

- Understanding the elasticity concept from readings
- Measures of elasticity derived from other railway studies
- Guidelines received from transport researchers during interviews
- Own study in Malaysia in order to estimate MR elasticity
- Using information from field work - ie. an opinion survey conducted to discover the background features and responses associated with existing MR services and their travelling public, aimed at differentiating travel times (when demand was high and when low) thus helping in the process of estimating MR market segment elasticities.

From here the study moves to segment the market and isolate the area which can be chosen for fare adjustment in the experiment. Next, models were constructed to test this out over a range of elasticities and range of fare movements, so as to estimate starting points within which the MR can manoeuvre without risking to lose much revenue. Here also it shows the possible cut-off point (theoretically) limiting the fare changes and



revenue changes, so preventing MR from further losses. The key outcome then, was to design an experiment with a proposal for fare changes which demonstrated the possibility of increased revenue.

Whether or not the experiment will be carried out depend on these two conditions:

1. Negotiation and agreement between MR and Government to go ahead
2. How much commitment MR management has towards this project

In case of failure to get MR to implement the suggested experiment, the elasticity measurement exercise still can be carried out using SP methods as a further study by the researcher. Then RP approach can be done if MR has a fare change (which is probably due soon anyhow). The gap between two previous fare revisions is 8 years (1976 and 1984). The statistical data can be collected as has been done for this study. If MR does not introduce the fare changes until the end of 1991, the elasticity measurement work can be extended or transferred to other types of public transport, which have a larger market share and are run by hundreds of private operators.

## **1.8 Contribution**

Although demand and revenue forecasts derived from previous revenues have been made in conjunction with fare elasticity estimates, these were carried out in developed country economies where longer-term stable trends had become apparent. The major contribution of this thesis on the other hand is to take actual passenger numbers and seat occupancy numbers for each service and class of accommodation and type of train and to develop particular revenue forecasts using individual elasticity estimates not as a single figure, but within a defined range. This approach was made feasible by the relatively small size of MR's system compared with those forming the context of previous studies. It was



deemed especially suitable for MR, since Malaysia is a developing country in which rail travel preferences are likely to be less constant than in more developed economies.

Introduction of SP methods has been used elsewhere, but strangely separated from RP. Whereas in this thesis, both are taken together in order to ascertain how consumer preference and background might affect future rail travel. Usually, RP methods are used to calculate what was the fare elasticity of demand over a given time - period, and lately SP methods have been used to produce elasticity estimates for future time - periods when fares may be altered. The contribution in this study is that *both RP and SP methods are used in conjunction with each other for the first time resulting in a single range of elasticity estimate*. An indication is given on how adjustments in elasticity could be made once a full-scale survey has been undertaken as part of the Experiment. This should result in fare-setting which is much more finely attuned to a segmented market for rail travel

There were few fare experiments done before but as discovered by KEMP (1973).

*"Unfortunately, very few of these experiments have been concerned with pricing, and where fare levels have been varied, they have often coupled with service changes."*

The literature provides no evidence except one study by Peat, Marwick (1977) on using elasticity estimates for either revenue forecasts or for later (second round) fare adjustments. Both aspects seem vital to MR for carrying out a fare experiment. Therefore the proposals in this thesis are designed to suggest to MR that they should:

1. Increase the fare without improving the quality of service during experimentation.



2. Use elasticity estimates resulting from fare changes experiments to forecast revenue resulting from further (planned) fare changes.
3. By means of a simulation process MR should choose the 'best' fare for each service: this will result from combining a range of different elasticity values with a range of fare increases.

In Britain, the Institute for Survey Research (SCPR) has carried out a fare elasticity experiment, (HEDGES et al (1974)) but it dealt with a 50% fare reduction for urban transportation in Tyneside which covered the period of three months only and there was no calculation on the effect on revenue due to the fare changes involved. On the other hand, this present research suggestion will cover inter-urban travelling activities for the fare increases for the longer period of one year.

## **1.9 Thesis Structure**

The thesis is divided into eight chapters. Following this general introduction, chapter Two considers the background of Malayan Railway (MR) so to examine the problem areas and the possible ways to solve them. Chapter Three discusses the methodology and data sources. It includes the strengths and weaknesses of all sources.

Chapter Four examines the costs related to rate - making in MR, analysing questionnaires from the first survey in detail, analysis of rate of occupancy data and other MR statistics. The rest of this chapter highlights the elasticity range from the literature.

Chapter Five introduces the concept of elasticity of demand with special reference to arc and point price elasticity in public transportation applications. Literature is reviewed, examined and discussed in order to see the usefulness of this theory when it is applied to

a real, established railway system. Some findings were extracted from previous studies on the elasticity estimates of passenger services (both bus and train) so as to be used as initial estimates for fare experimentation purposes.

It also includes the elasticity range derived from previous work on other railway and bus systems which is to be applied in the MR experiment. The last part of this chapter estimates fare elasticity from MR's own data on the last fare changes in 1984, followed by elasticity grouping according to type of tickets and time of travel based on the MR occupancy rate data of 1987.

Chapter Six deals with the fare experimentation suggested to be carried out by MR. It covers the two further surveys carried out in February and March 1990 using a modified conjoint analysis and trade-off approach. This chapter also discusses in detail the feasibility study, including assessment of risks and benefits in terms of revenue; these are based on the earlier theory and previous findings of other railways, plus whatever was available from MR itself up to the end of 1987.

This is followed by Chapter Seven with discussion on the implications of experimentation to MR and to government. Finally, Chapter Eight sets out the major conclusions that can be drawn from this research, and promulgates other possible strategies and developments which might help reduce MR financial losses. Some suggestions are made concerning future studies in this area, which could be extended to other forms of public transport in Malaysia.



## CHAPTER TWO

### BACKGROUND

#### 2.1 Malaysia

##### 2.1.1 Geographical Setting

Malaysia is a small country in South East Asia which is divided into two separate geographical areas viz, Peninsular Malaysia, originally known as Malaya, and East Malaysia; Peninsular Malaysia is attached to mainland Asia with Thailand at its northern border and Singapore Island in the South. East Malaysia is comprised of two states, Sabah and Sarawak which are in northern Borneo. West and East Malaysia are separated by the South China Sea.

As the Malayan Railway Administration operates in Peninsular Malaysia, this study will cover only the Peninsula, particularly the West-Coast or Main Line from Butterworth in the North, to Singapore in the South via Kuala Lumpur, the capital, and one branch line from Bukit Mertajam upwards to Padang Besar at the Malaysia/Thailand border. The total area of Malaysia is 332,952 sq. km. Peninsular Malaysia alone is 131,537 sq. km. The total population in 1986 was 16.1 million which is expected to increase to 17.9 million in 1990 with a growth rate of 2.5% per annum. Out of the total population, 13.3 million were in the Peninsula, which gives a population density in the Peninsula of 101 per sq. km.

The main products of the country are electronic component, rubber, palm oil, sawn timber, crude petroleum and tin. These are also the major exports.



### **2.1.2 Historical Perspective**

The British arrived first in Penang in 1786. Within forty years they gained control of Singapore and Malaya. These three states were later known as Strait Settlement, becoming the centre of administrative and commercial population. About a century later, Malaya was formed under the British administration. Perak and Selangor had their first British Residents in 1874, Penang and Sungei Ujong (N. Sembilan) in 1888, Kedah, Perlis, Kelantan and Trengganu in 1909, and lastly Johore came under the British in 1914.

In the early 1880's, tin was found for the first time in Larut (Perak) on the West Coast of Malaya. In the early days rivers had served as highways upon which tin ore and crops had been transported from inland to the ports at Penang and Singapore. As the tin mining activity moved farther upriver, the British administrators realised that a more effective transport system was needed. The road network had developed outwards from the major coastal towns in Province Wellesley, Penang and Malacca. The addition of railways in 1886 to this simple transport system provided a more reliable form of haulage. The growth of the road network from railway terminals complemented further railway construction.

The initial period of transportation development reflected an effort to build the several States under British administration into a well-knit political unit. It also speeded up the economic development of the West Coast of the Peninsula because tin, rubber and other agricultural products had easy access to the ports.

### **2.1.3 The Role of Transportation in National Development**

Transportation plays a vital part in national development, not only in stimulating economic growth but also in fostering political and social cohesion. The present policy and



objectives of transportation service in Malaysia run parallel with those of the 5-year Malaysia Plans which were started in 1966.

In the first Malaysia Plan (1966-1970) an effective transportation system was needed to stimulate economic growth, primarily to improve the existing pattern of production and distribution, generate new economic activities and widen the market for goods and services.

The second Malaysia Plan (1971-1975), emphasised the New Economic Policy, so transportation and communication had important roles in promoting greater integration of all Malaysians in the process of nation building.

In the third Malaysia Plan (1976-1980), the government accorded high priority to the improvements and expansion of the transportation and communication systems both to provide the infrastructure for industrial growth as well as to accelerate the development of agricultural and natural resources, especially in less developed regions.

In the fourth Malaysia Plan (1981-1985), the essential role of transportation and communication was to provide the foundation for the development of the major sector as well as the less developed regions, and facilitate their growth.

Now Malaysia is in its fifth Malaysia Plan (1986-1990). Despite the world economic recession, which Malaysia was also suffering, the government intends to continue all the transportation and communication projects which are in progress. The allocation in the fifth Malaysia Plan is M\$20,466.97\* Mil. compared to only half of this amount in the previous Plan, which only provided M\$10,153.67 Mil. This amount then divided into two where 50% is for transportation and another 50% is for communication projects.

---

\* Note: Malaysian dollar (\$) is known as Malaysian Ringgit and its exchange rate on 28 September 1989 is around M\$4.20 per £1 sterling.



Although these five Malaysian Plans have underlined the importance of transport and communication in national development they have mainly dealt with types of transport other than rail. For since the present MR network was first completed in 1967 (during the first Malaysia Plan) only two short lines have been constructed - one from Johore Bharu to Pasir Gudang Port (for goods), the other from Kuala Lumpur to Subang Airport (for petrol). The new passenger lines which cover Seremban - Rawang via Kuala Lumpur and Kuala Lumpur - Port Klang routes are under construction. Both lines are parallel to the present ones..

Once, there appeared a plan for a second line to cross from Kuala Lumpur to Kuantan and Kuala Trengganu, but it never made any practical progress, due to financial constraints imposed by the government. In fact, some services were even closed down. Most railway stations still look just as they did before the Second World War (except for some improvements to the main terminus at Kuala Lumpur and a few other main stations). So MR has become the 'Cinderella' of expenditure on transportation in national development.

On the other hand, road and highway construction progressed more rapidly, especially with the major East-West highway through Grik and another passing through Kuala Lumpur - Kuala Lipis to Gua Musang. (See map on Appendix A). At the same time as new highways were opened up all over the country, an extensive improvement programme for old roads and old highways was undertaken, together with some new roads. Naturally, these schemes encouraged expansion of private car ownership and private bus and coach services competing with MR.

Regarding the road transportation system, the infrastructure comprising bus and taxi terminals belongs to government (both State and the Federals) whereas the operating vehicles (bus, taxi, lorry, van, etc.) belong to a separate entity, either private company operators or individual private owners. The management, therefore, are able to concentrate



only on the service they provide. In the civil aviation case, the organisation is already more commercial and thus better able to act freely as a commercial body. Indeed, 30% of issued shares are already privatised, with government owning another 70% . In the railway system, all the infrastructure and operating equipment are the responsibility of MR, yet the power they enjoy is very limited, and any policy action they want to take has to be referred to the ministries concerned.

#### **2.1.4 Government Financial Allocation for Transport**

During the past few years, MR has attracted much attention as a result of its financial deterioration. MR management is very concerned about this matter because of its effect on staff morale and productivity. The most important cause of such a difficult financial position is that the needs of MR have been ignored for too long, as can be seen from the financial allocation for transport in West Malaysia under various Malaysia Plans, as given in table 2.1.

Comparison of the financial allocations among the different transport sectors shows that MR has been given low priority in its development programmes. The need of MR to develop a modern and efficient service has not received much attention from the government.

**TABLE 2.1**  
**DEVELOPMENT ALLOCATION FOR TRANSPORT IN WEST MALAYSIA UNDER VARIOUS MALAYSIA PLANS**

|                      | First Malaysia Plan<br>1966-1970 |       | Second Malaysia Plan<br>1971-1975 |       | Third Malaysia Plan<br>1976-1980 |       | Fourth Malaysia Plan<br>1981-1985 |       | Fifth Malaysia Plan<br>1986-1990 |       |
|----------------------|----------------------------------|-------|-----------------------------------|-------|----------------------------------|-------|-----------------------------------|-------|----------------------------------|-------|
|                      | Mil<br>(M\$)                     | %     | Mil<br>(M\$)                      | %     | Mil<br>(M\$)                     | %     | Mil<br>(M\$)                      | %     | Mil<br>(M\$)                     | %     |
| Roads and bridges    | 256.0                            | 56.8  | 531.19                            | 51.2  | 2344.36                          | 65.5  | 3573.16                           | 63.0  | 7644.10                          | 71.0  |
| Railway              | 59.7                             | 13.2  | 90.00                             | 8.7   | 350.00                           | 9.8   | 559.26                            | 9.9   | 1049.42                          | 9.8   |
| Ports                | 114.2                            | 25.3  | 198.09                            | 19.1  | 618.86                           | 17.3  | 967.45                            | 17.0  | 400.69                           | 3.7   |
| Civil aviation       | 21.0                             | 4.7   | 158.80                            | 15.3  | 264.93                           | 7.4   | 524.68                            | 9.2   | 1666.72                          | 15.49 |
| Plants and equipment | *                                | -     | 56.64                             | 5.7   | *                                | -     | 50.25                             | 0.9   | *                                | -     |
| TOTAL                | 450.9                            | 100.0 | 1036.86                           | 100.0 | 3578.15                          | 100.0 | 5674.08                           | 100.0 | 10760.93                         | 100.0 |

\* Already included in the road

Source: (1) Various mid-term review of Malaysia Plans (1966-1985)  
(2) Fifth Malaysia Plan (1986-1990)



## **2.2 Malayan Railway (MR) - Keretapi Tanah Melayu**

### **2.2.1 History from 1886**

The first railway line was opened on 1 June 1886 where 8 miles of railroad were laid between Taiping and Port Weld (Kuala Sepetang), followed by a line between Kuala Lumpur and Port Klang later in the same year. Another two lines were also built around 1887, via Seremban to Port Dickson and Teluk Intan (Teluk Anson) to Ipoh (see figure B-1, Appendix B). By 1903, a line was completed from Prai (Province Wellesley) in the North to Seremban in the South. In 1905 the main route was extended from Seremban to Tampin. In 1905 the route reached the extreme southern part of the country, at Johore Bharu, opposite Singapore Island, on which a local line had already been built in 1903 (see figure B-2, Appendix B). Johore Bharu and Singapore line were linked in 1913, when a causeway carrying both road and rail was constructed.

In 1918, a branch line from Bukit Mertajam to Padang Besar, on the Malaysia-Thailand border, was constructed. By 1923, a direct line from Padang Besar, southwards to Singapore, via Kuala Lumpur was completed. (See figure B-3, Appendix B).

On the East coast, railway track development started in 1931, from Kuala Lumpur to Tumpat in Kelantan via Gemas (see figure B-4, Appendix B). The completion of the East coast and West coast lines marked the end of railway track development in Peninsular Malaysia until about 35 years later. In 1966, a route about 9.5 km long was opened in Singapore, between Bukit Timah and Jurong, a new industrial zone, where oil and other bulk traffic are now concentrated. In 1967, the northern end of the main line was extended from Prai to Butterworth, with a swing bridge over the Prai River.

FIGURE 2.1  
MALAYAN RAILWAY LINE 1987





In 1981, a line from Kempas, on the main line, was constructed to the new port development at Pasir Gudang, near Johore Bharu. Though this is a very short line, it is very significant because it diverts the flow of the goods traffic from Singapore to Johore Bharu. Another recent development is the on-going construction of a short line from Kuala Lumpur to the National Oil Corporation (PETRONAS) petrol farm near Subang International Airport. The present MR line is on figure 2.1.

Some branch lines like Pasir Mas to Golok on the East -Coast line and local services from Arau to Padang Besar (except for International Express Service) in the North were discontinued due to certain reasons such as smuggling.

Other lines were closed down because Malayan Railways were unable to compete with road haulage. This occurred on the lines between Kuala Lumpur and Port Klang, and between Kuala Selangor and Kuala Pilah.

### **2.2.2 MR Organisation**

Originally, the railway was administered by the state which opened it: for example, Selangor Government Railway in Selangor and Sungai Ujong Railway in Negeri Sembilan. From 1901 to 1947 the state Railways were amalgamated and administered by the Federated Malay State Railway - FMSR (The Federation of the States of Perak, Selangor, Pahang and Negri Sembilan). In 1948, the Railway Ordinance was enacted.

For the purpose of continuity, and in order to make it a legal entity, the railway authority is now incorporated as an autonomous corporation under the Railway Ordinance. It is known as the Malayan Railway Administration (MRA) or Pentadbiran Keretapi Tanah Melayu (PKTM). It is a public statutory body; a nationally owned and organised industry, having its own essential powers and obligations (this part only is in writing because MR never has been given enough power).



MR comes under the jurisdiction of the Ministry of Transport. However, the Ministry of Finance, the Ministry of Labour and the Railway Service Commission have a great deal of say in its operation. The financial procedures and issues come under the Ministry of Finance. The Commission has the authority and responsibility to appoint and promote all railway personnel and exercise disciplinary control over them. Some functions of the Commission may be delegated to the General Manager. The Ministry of Labour also takes a major role in railway activities related to railway employees, and implements any changes in the railway laws and regulations, so bringing them into line with those applied in other government departments. For a long time the status of railway employees was a matter of contention between the MR Administration (the government) and the Railwaymen's Union of Malaya. It was finally resolved in 1964 by a High Court decision which judged railway employees to be government servants. Probably, their status is the most formidable obstacle to achieving a more efficient and commercially minded industry.

The MR has been compelled to function as a government department, with responsibility for spending money, and yet is generally considered to have a duty to run a commercially viable organisation. This situation produces both conflict and inertia, leading to lowered morale in management, who can take few initiatives, and to a lack of market awareness.

The present situation in authority and responsibility are as follows:

1. The Railway Services Commission (RSC) has full authority over employees but not responsibility for their performance or for that of the enterprise. RSC is a division in the Public Service Department which deal with railway employees. Federal Government fund is allocated for the railway employees through the RSC.
2. The Minister of Transport has the authority over the operation of MR but delegates the responsibility for the final results to the General Manager.



3. The General Manager has all the responsibility for the performance of the MR but very limited authority.

It seems that MR, or in other words, its General Manager holds responsibility for performance, but is unable to make his decision freely. He has to answer to the Railway Service Commission and to all the Ministries involved (Transport, Labour and Finance). Although it is stated in the Ordinance that MR has its own power and obligation, in practice there exists imbalance : they have a full obligation, but a small decision - power.

This is one of the main reasons for less productive and less committed attitudes among management and other employees. They do not wish to bother to struggle in order to make MR operate more efficiently and profitably, because it is not 'appreciated' by government. The most the top management can achieve is to be transferred to another government department for promotion.

It is hoped that if MR could make full use of their available resources within the one year of fare experiments, suggested in this study, they will be able to persuade government to give more authority to top management in the future.

#### **2.2.2.1 MR Administration**

The General Manager is appointed by His Majesty The Yang Di Pertuan Agong (The King) on the recommendation of the government. He is normally a Senior Officer in the Civil Service. He is responsible for day-to-day management.

On matters pertaining to policy, the General Manager is served by a Railway Advisory Board, which was established under Section 7 of the Railway Ordinance, 1948. The requirement to consult the Board causes delays in finalising any matter, which results in an outdated decision. This may cause problems because MR is now operating in a competitive environment.

The Board usually has the final say on railway tariffs, estimates of revenue and expenditure and on all major policy aspects relating to the function and management of the railway. The Chairman of the Board is an independent party from the MR, normally he is a very Senior government officer. He is appointed by the government, while the Deputy Chairman is the General Manager of MR. There are 4 official members, 5 unofficial members and 1 Secretary on the Board. The 4 official members are representatives of the following Ministries - Ministry of Transport, Treasury (Ministry of Finance), Ministry of Trade and Prime Minister's Department (Economic Planning Unit). (See figure 2.2).

### **2.2.3 MR System**

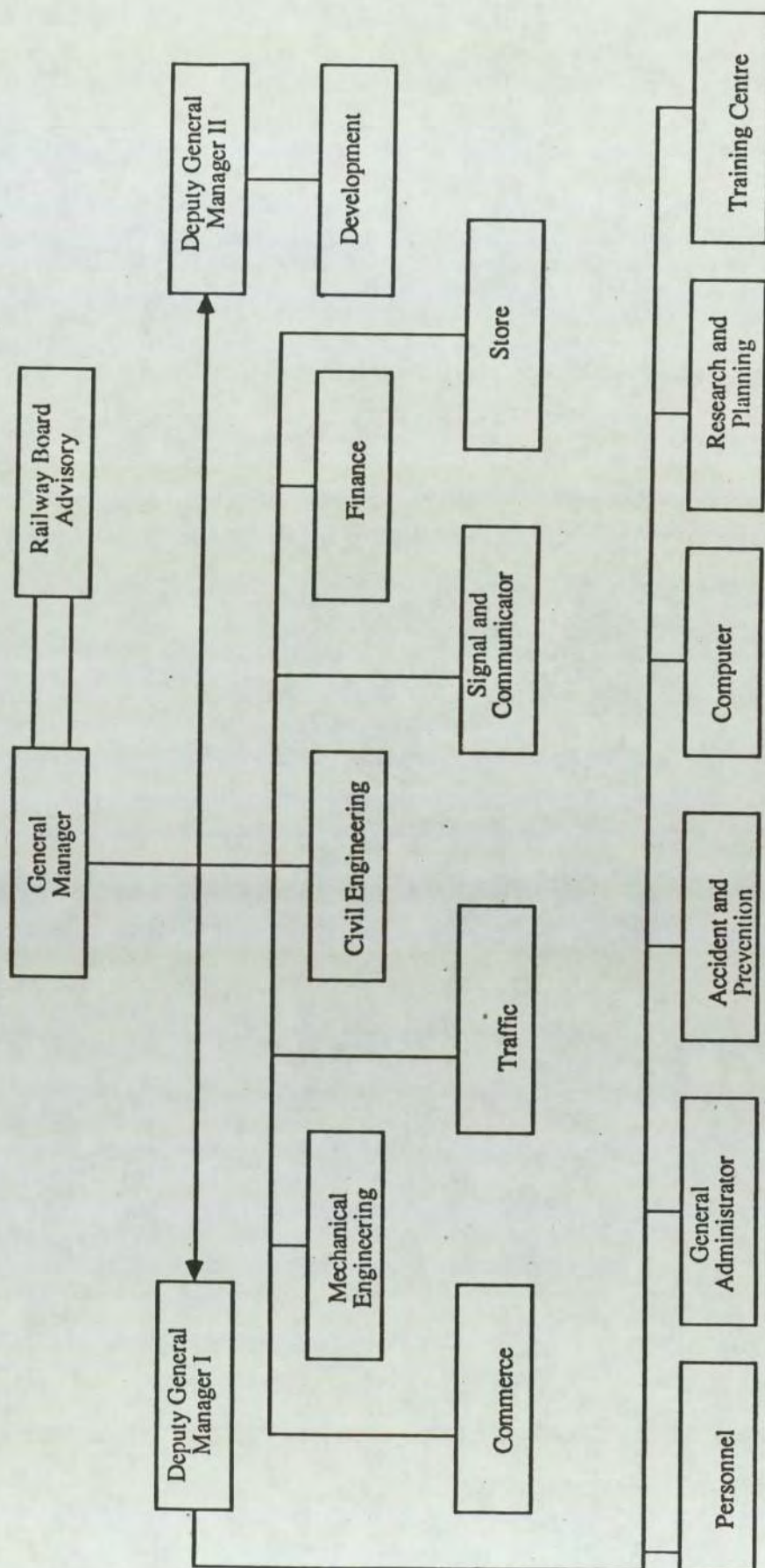
The total length of the MR track is about 2156 km made up of 80lb rail on the main line and 60lb on branch lines. The network is single-tracked, apart from a small double-tracked section from Kuala Lumpur station to Salak South (some 8 km), and sections of multiple track around some stations and goods yards. It has a one metre gauge track. This means it is a smaller track than standard gauge (1.435 m).

At present, MR is running 10 express and 41 ordinary trains daily on the mainline between Butterworth and Singapore, making a total of 51 passenger trains throughout the system and occasionally this total is increased due to the running of additional trains on festival days.



FIGURE 2.2

ORGANISATION CHART OF MR



#### **2.2.4 MR Objectives**

##### **2.2.4.1 General Objectives**

The objective of the MR is to provide an adequate, convenient, reliable, efficient, safe, fast and comfortable transport service fully competitive with other modes of transport. It aims to meet the national, social, and economic development requirements of the country consistent with modern technological development in the transport industry of Malaysia.

##### **2.2.4.2 Service Objectives**

The MR's objectives have been spelled out in an internal document, (MASRI, 1981). In detail, they can be expressed as follows:

1. To provide transportation services directly or indirectly to all areas of economic development and specifically to provide the carriage of goods for the mining, industrial, agricultural, forestry, commercial and other sectors of the economy.
2. To provide for the public conveyance of passengers in both urban and rural areas.
3. To provide for the carriage of other types of commodities not listed above.
4. To provide transportation outlets for all ports.
5. To provide inter-state and inter-urban services.
6. To provide suburban passenger services, commuter and rapid transit services.



7. To provide branch and feeder lines services.
8. To engage in freightliner and bulk-traffic, wagon load traffic and part load traffic.
9. To provide and develop other services and business activities related to increasing the utilisation of the basic railway services, and to improve the quality and competitive condition of its service eg. tourist and travel agencies, lorry, container and hotel and restaurant, pipelines, forwarding agencies, door-to-door services, etc.

Relating to this, we need to note that 'hotel' refers to those available in the big stations, eg. in Kuala Lumpur, Ipoh, Taiping, Butterworth, Johore Bharu and Singapore. Restaurant and cafeteria facilities are available in almost every station.

#### **2.2.5 MR in National Development**

Since Independence in 1957, the length of railway track has not increased except from Bukit Timah and Jurong for 9.5km, the additional line of 32km from Johore Bharu to Pasir Gudang Port and 8km from Kuala Lumpur to Subang Airport Petrol Farm (still under construction). In spite of the lack of changes in infrastructure and relatively small amount of financial allocation, the government still have their eyes on MR development. In the first Malaysian Plan, Government gave top priority to resolving MR's management and administrative problems so that this large government enterprise can be put on a sound and profitable footing. It was followed by a new corporate strategy plan in the second Malaysian Plan. In that new Corporate Planning some of the major elements were:

1. To improve and expand the railway's share of the transport market.



2. Development of a new costing system to facilitate the establishment of an appropriate cost-based and competitive pricing policy.
3. Modernising its accounting system in line with sound commercial and business practices.

The MR has also proceeded with its re-equipment programme. The first Malaysian Plan allocated a total expenditure amounting M\$34.7M. Of this total, M\$27.4M was financed from the Railway's renewal funds. The balance came from the Federal Development Estimates. Ten diesel locomotives were purchased during this Plan. In the 1971-75 period (second Plan) MR was awarded M\$94M where the main objective was to improve the efficiency of the system to meet the expected increase in traffic, particularly bulk traffic. The major programmes included replacement of obsolete rolling stock and installation of new signalling and telecommunications facilities. The Seremban - Port Dickson line was reconstructed to provide a more efficient service for the expanding petroleum industry at Port Dickson. The railway tariff structure was modified in 1972 to make the railway more competitive in the carriage of long haul bulk traffic - traffic which the railway is best suited to carry.

During the third Plan (1976-80) new coaches were purchased and put into operation. As a measure of ensuring the safety and smooth running of coaches and wagons, about 24 miles of new rail were installed and 115 miles rehabilitated (1978 figures). Furthermore, a survey of 851 railway bridges was completed with a view to drawing up a programme for their rehabilitation.

One of the major thrusts of programmes and projects of the MR in the fourth Plan was the improvement of safety aspects of train operation. To that end, a number of railway bridges were strengthened, tracks were renewed and dilapidated rolling stock replaced. All the unmanned level-crossings, totalling 47 in number, were improved by the installation of



gates and were manned to reduce traffic congestion and accidents. With the completion of the 32km spur line linking Kempas on the main track to the Johore Port at Pasir Gudang in January 1983, the total track length of the MR system increased to 1,580km.

A railway Master Plan for the development of a double track, steel gauge and electrified new West-Coast line linking Butterworth with Johore Bharu and a new East-West line linking Kuala Lumpur, Kuantan, Kuala Trengganu with Kota Bharu was completed in 1985. The aim of the study was to modernise and expand the railway system to meet the transportation requirements of the 1990's and beyond. Unfortunately, with the main reason as 'economic recession', this Master Plan remains a plan at the moment.

MR did manage to implement some development programmes in that period (fourth Plan, 1981-1985) which included the track renewal programme covering parts of the West and East lines to improve the level of train operation. A rail link and other associated facilities to the new general Post Office and the postal service department headquarters at the Dayabumi Complex in Kuala Lumpur were completed. While a short line from Sungai Way to the National Oil Corporation fuel farm in Subang is expected to be completed in the fifth Malaysia Plan (1986-1990).

The role of MR is much strengthened now, with government attending to the rail network, with higher energy costs in the world and an increased pace of industrialisation in Malaysia, following the government's drive for reconstructing the economy and the multiplicity of urban and industrial developments within Peninsular Malaysia. There is a need for rapid travel between these centres of development. Government has set the stage; now action is required to improve rail services, as much for passenger as for freight.

Although several development programmes have been drawn up inside MR such as electrification or track duplication, none reached a stage where more customers could be attracted to use MR services through catering for demand, eg. shorter distances



commuting. A one year experiment with a 'railbus' in 1986 was successful (MR borrowed the rolling stock from another country). However, full implementation by MR remained no more than a plan at the end of 1988. Nevertheless, it was a step in the right direction.

#### **2.2.6 Financial Aid from the Government**

Financial assistance is granted to the railway by Federal Government through a variety of channels. The former subsidy on diesel fuel, also enjoyed by other modes of transport, was one form of assistance. Other financial aid has come in the following forms:

- (a) Tax relief on equipment and supplies both imported and home-produced.
- (b) Cash grants and subsidies to partially off-set capital costs on operating losses for uneconomic passenger and communal services; Government has reimbursed the railway for 50% of direct operating losses for certain branch line passenger services every year. Over the period of 1973-1980 MR has received M\$4,366M as a contribution towards passenger operation losses on the Kedah, Teluk Intan, Pasir Mas-Golok branch lines, Mela-Kuala Lipis section, and Port Kelang mixed service (a freight and passenger service which is now discontinued).
- (c) Government loans and guarantees enabling borrowing below commercial rates. Government have generally charged 2-3% below the commercial prime rates. Government development loans and grants from 1956 to 1985 are as overleaf in table 2.2.



**TABLE 2.2**  
**GOVERNMENT LOANS AND GRANTS TO MR 1956-1985**

| ECONOMIC             | YEAR    | LOANS<br>M\$ MILLION | GRANTS<br>M\$ MILLION |
|----------------------|---------|----------------------|-----------------------|
| First Malaya Plan    | 1956-60 | 24,599               | -                     |
| Second Malaya Plan   | 1961-65 | 19,747               | -                     |
| First Malaysia Plan  | 1966-70 | 8,085                | -                     |
| Second Malaysia Plan | 1971-75 | 42,872               | -                     |
| Third Malaysia Plan  | 1976-80 | 131,381              | -                     |
| Fourth Malaysia Plan | 1981-85 | 384,858              | 56,915                |

\* Source: Various Malaya/Malaysia Plans

- (d) Moratorium on certain historical loan payments and government assumption of pension fund and Employers Providence Fund (EPF) liability.

A major area of concern is that involving government subsidies of MR operating losses. Although, there exists no clear definition of what constitutes 'public service obligation' (PSO) it simply means providing loss - making services desired by the government. For example, the Teluk Intan branch line and the Kedah branch line, both incur heavy annual losses, and MR would be better off not providing these services if it were possible to avoid doing so. MR remains responsible, but is powerless to alter the position. Yet alternative policies *are* available to the government, namely:

1. Cover 100% of losses incurred by those services.



2. Allocate more financial aid to improve those services in order to attract more customers and/or to conduct studies so that services can match demand.

Better figures for financial performance have been achieved since 1982, when the pension fund and Employers Provident Fund liability were taken over by the government. It could be argued that government should likewise take over the burden imposed on the employee account whenever new retroactive pay awards and structures are brought in. After all, MR staff are considered as government servants/civil service, and the wage and salary bill forms a very large part (taking 60% of MR revenue, MR Study, MR Report (1986)) of administrative overheads; yet, there is no clear allocation made in the MR annual financial statement. Other railways normally allocate about 30% to 50% of their overhead expenses on salary.

## **2.3 Malayan Railway Operation and Performance**

### **2.3.1 Context**

Since MR has a simple system and less than 2000km length of route, its operation is not complicated. It offers three services which are, freight, passenger, and mail and parcel. MR's freight and passenger market have expanded very slowly over the last 2 decades, this leading to a decline in their market share. From ever since it was founded right until the 1960's MR enjoyed monopoly power in the transportation industry, but this status became eroded as development of the country took place. While the road and air transport sectors have grown, the existing railway network has remained static.

Although buses, taxis and private cars already existed before rapid development of roads and highways took place, the latter's effect was to transfer large numbers of travellers from trains to various forms of road transport, which appears to offer a faster and more comfortable service (eg. door-to-door). Rising incomes and standards of living resulting



from national development plans have meant that more people could afford their own cars, or to travel by luxury coach and aeroplane over long distances.

### **2.3.2 Freight Traffic in General**

In order to show the importance of passenger service over freight, a general description of freight traffic is given, as follows:

Main freight flows are along Butterworth to Kuala Lumpur down to Singapore. A large proportion of tin, or its related products, rubber and latex, and crude palm oil are among the main freight carried along this line.

The production of cement is concentrated at Ipoh on the West-coast of Peninsula. Chemical products is another bulk traffic which together with other products flow towards Singapore every day. The East-coast line contributes only a small portion of traffic, mainly carrying timber and sawn timber from the jungle part between Pahang and Kelantan. One of the longest freight hauls on the system was that of transportation of iron ore traffic on the East-Coast line, from Kuala Lipis to Gemas and to the steel plant at Butterworth, about 1000km. Another freight traffic is petroleum from the refinery station in Port Dickson to industrial areas located mostly in the West-Coast of Peninsula.

Although freight traffic earlier showed an average annual growth of 1% in respect of tonnage handled and 3.78% in respect of revenue, it has shown a declining trend from the year 1980 onwards, (see Table C2, Appendix C). Freight volume declined from 3.23m tonnes (1982) to 2.86m tonnes (1986). This led to a fall in revenue earned from freight service of 3.3% per annum, ie. from M\$ 57.82 (1982) to M\$50.32m (1986). This decline in the volume of freight traffic was mainly due to the constraints of MR; another reason was the general economic slowdown.

### **2.3.3 Passenger Traffic**

The main service is the inter-city/urban and rural areas for first, second and third class, day and night service. The passenger service operates on two main lines; the first is the West Coast line (location for the pilot survey) with an express train service running from Singapore northward (towards Bangkok in Thailand) via Gemas, Kuala Lumpur, Tapah Road, and Taiping, as far as Butterworth; the continuation from Bukit Mertajam to Padang Besar is known as the Kedah branch line, with just an ordinary passenger train service and International Express Service to Hadyai and Bangkok. Other minor branch lines connects Seremban with Port Dickson (the Taiping link with Port Weld is closed). The second mainline, with ordinary train and mail train services only runs from Gemas through the centre of Malaysia via Kuala Lipis to Tumpat. A branch line from Pasir Mas to Golok on the Thailand border was closed in the late 1970's.

#### **2.3.3.1 Type of Service**

There are six passenger services offered by MR on the West-Coast line, namely:

1. Morning and Evening Express
2. Rakyat Express
3. Mail train
4. Night sleeper (Senandung Malam)
5. Local train (normal service)
6. Other services.

On the East-Coast line only mail service and normal train service are available. On the branch lines, the only service offered is normal train.



### **1 . Sinaran Pagi/Petang Express (SPE)**

Originally known as KTM Express, this, the newest inter-city train service, was introduced in March 1980 on the Kuala Lumpur - Butterworth and Kuala Lumpur - Singapore routes once a day. In 1984 it ran twice a day on both routes. Making only limited stops en route, the northbound service only stops at stations in Tapah Road, Batu Gajah, Ipoh, Kuala Kangsar, Taiping, Bukit Mertajam and Butterworth, whilst the southbound service stops only at Seremban, Tampin, Segamat, Keluang, Johore Bharu and Singapore. All air conditioned coaches on this service are fitted with closed-circuit television. At present it caters only for first and second class travellers. Targetted primarily at the businessman, this service will be further enhanced with the provision of on-board telephone and telex facilities.

### **2 . Rakyat Express (RE) - People's Express**

It was introduced in late 1976 and inside 12 years it became the most popular express service. It operates daily between Singapore and Butterworth, via Kuala Lumpur. This service stops at Johore Bahru, Keluang, Segamat, Tampin, Seremban, Kuala Lumpur, Tapah Road, Kampar, Ipoh, Batu Gajah, Kuala Kangsar, Taiping, Parit Buntar and Bukit Mertajam before arriving at the terminus in Butterworth. It is for second and third class travellers.

### **3 . Day and Night Mail Service**

It caters for the long distance journey. With twice a day service the daymail stops at all stations, but the night mail only stops at the big stations. The passengers can choose any of the classes, either first, second or third, according to what they are willing and able to pay.



#### **4 . Night Sleeper (Senandung Malam)**

It is a daily sectional service originating from Kuala Lumpur. This service is intended for night passenger travel to and from Butterworth and Singapore respectively. It provides sleepers for first and second class travellers. Reservations can be made 30 days in advance. During festival times (peak-time) a third class service is also offered on this train.

#### **5 . Local Train (normal train)**

Most of this service is meant for the rural area community, where road transportation is limited, such as in the remote areas in the East-Coast line. It also operates from Bukit Mertajam to Padang Besar (Kedah Branch Line), with a branch line from Tapah Road to Teluk Intan. If any freight coach connects to it, the service will normally be known as mixed train.

#### **6 . Other Services**

In conjunction with the State Railway of Thailand, MR operates the tri-weekly International Express between Butterworth (opposite Penang Island) and Bangkok (Capital City of Thailand). Another service is from Kuala Lumpur to Hadyai in Thailand, which is known as Mesra Express (air conditioned). Both services are for first and second class with sleeping cabin and other facilities. Most of the passengers are tourist.

##### **2.3.3.2 Passenger Traffic Performance**

Due especially to improvements to facilities and services provided for passenger convenience and comfort both at the stations and on trains, passenger traffic is showing a definite growth pattern. In 1986, MR carried 6,735 million passengers generating 1.46 passenger km and a revenue of M\$62,889,763.



The number of passengers travelling by MR during the period 1977 to 1986, shows an average decline of 14.1% whilst revenues show an average annual growth of 4.9%. The decline in passenger journeys during the period in question is due to the cancellation of trains on the branch lines. The commuter trains on the Port Klang branch line were discontinued in 1977 for operational reasons and it was also found that the diesel railcars that were used were very expensive to maintain. There is also a heavy loss of passengers to buses, particularly in Kelantan where the new highway between Krai and Gua Musang - which is running parallel to the railway line - was opened early in 1986.

Within the period 1982 to 1986, the third class captured the lion's share of the market, but in terms of revenue, the second class showed an accelerated growth of contribution. In 1982, second class passenger revenue was just about one third of the collection (37.4%), but 5 years later it gave about 60% of the passenger revenue. On the other hand, the third class revenue showed the reverse position; it started from 59.7% in 1982, and declined to 36.3% in 1986. While the first class showed a small growth in 1983 to 1985, but fell again in 1986. Table 2.3.

**TABLE 2.3**  
**MALAYAN RAILWAY PERCENTAGES OF PASSENGER - JOURNEYS,**  
**PASSENGER - KM & PASSENGER - REVENUE OF THE THREE CLASSES OF**  
**SERVICE 1982-1986**

| Year | Passenger - journey |      |      |       | Passenger - km |      |      |       | Passenger - revenue |      |      |       |
|------|---------------------|------|------|-------|----------------|------|------|-------|---------------------|------|------|-------|
|      | 1st                 | 2nd  | 3rd  | Total | 1st            | 2nd  | 3rd  | Total | 1st                 | 2nd  | 3rd  | Total |
|      | (%)                 | (%)  | (%)  | (%)   | (%)            | (%)  | (%)  | (%)   | (%)                 | (%)  | (%)  | (%)   |
| 1982 | 0.5                 | 16.6 | 82.9 | 100   | 0.9            | 26.8 | 72.3 | 100   | 2.9                 | 37.4 | 59.7 | 100   |
| 1983 | 0.6                 | 17.7 | 81.7 | 100   | 0.9            | 28.8 | 70.3 | 100   | 2.8                 | 39.8 | 57.4 | 100   |
| 1984 | 0.7                 | 23.4 | 75.9 | 100   | 1.1            | 38.7 | 60.2 | 100   | 3.4                 | 50.1 | 46.5 | 100   |
| 1985 | 1.2                 | 26.8 | 72.0 | 100   | 2.0            | 43.4 | 54.6 | 100   | 5.9                 | 54.3 | 39.8 | 100   |
| 1986 | 1.1                 | 27.9 | 70.9 | 100   | 2.3            | 47.8 | 49.9 | 100   | 3.6                 | 60.1 | 36.3 | 100   |

Source: Commercial Department MR



**TABLE 2.4**  
**MALAYAN RAILWAY**  
**BREAKDOWN OF THE PERCENTAGES OF PASSENGER REVENUE**  
**FROM 2ND AND 3RD CLASS SERVICES 1982-1986**

| SECOND CLASS |                |                 |          |       | THIRD CLASS    |                 |          |         |
|--------------|----------------|-----------------|----------|-------|----------------|-----------------|----------|---------|
| Year         | Raykat Express | Sinaran Express | Ordinary | Total | Raykat Express | Sinaran Express | Ordinary | Total   |
| 1982         | 19.9%          | (b)8.8          | 8.7      | 37.4  | 20.4           | 11.1            | 28.1     | (a)59.7 |
| 1983         | 20.4           | 9.1             | 10.3     | 39.8  | 22.3           | 11.5            | 23.6     | 57.4    |
| 1984         | 11.6           | 32.0            | 6.5      | 50.1  | 19.0           | 8.4             | 19.1     | 46.5    |
| 1985         | 9.4            | 40.5            | 4.4      | 54.3  | 17.2           | 1.5             | 21.1     | 39.8    |
| 1986         | 10.6           | 42.7            | 6.8      | 60.1  | 19.3           | 0.8             | 16.2     | 36.3    |

\* Source: Commercial Department, MR

Note: The percentage balance of revenue goes to first class.

(a) % from the total passenger revenue

(b) Before 1984, the Sinaran Express was known as K.T.M Express and offered only a once daily service. In 1984, 2 services became available every day, one in the morning (Sinaran Pagi) and one in the afternoon (Sinaran Petang).

Table 2.4 shows the percentages of passenger revenue derived from second and third class services, broken down by type of service. Dramatic revenue growth from the Sinaran Express is shown by a leap from only 8.8% in 1982 up to 42.7% in 1986; it reveals the kind of demand that exists for this service. A steady demand trend for third class train services is also seen in the Raykat Service figures, and indicates that these should be retained over the immediate future. In 1987 the Sinaran Express, on the other hand, abolished its 3rd class service because of low demand.



Findings from the above analysis, as shown in table 2.3 and table 2.4 - together with percentages of occupancy data, findings from the pilot survey and MR management suggestions-will be used in adjusting the estimated elasticity values in the experimental proposal.

The 5 year (1982-1986) financial performance analysis shows that the passenger service contributes the highest portion of revenue compared to freight or other miscellaneous services. (See table 2.6). However, this trend is expected to change, according to MR forecasts, until 1990 where freight revenue will exceed passenger revenue (see table 2.7, 2.8 and 2.9), (MR Report 1986). Therefore, there exists a pressing need for MR to undertake an effective strategy, so as to increase revenue from its passenger services. It seems that MR have a better chance to increase revenue substantially through passenger services rather than freight services, which are facing stiff competition from both road haulage and marine transport operators.

#### **2.3.3.3 Passenger Tariff**

Under Section 40 of the Railway Ordinance, 1948 the General Manager may, with the approval of the Minister of Transport, by notification in the Federal Government Gazette:

- (a) fix the general fares to be paid by passengers;
- (b) classify goods and fix the general rates to be charged for their transportation;
- (c) fix the general rates to be charged for the conveyance of passengers' luggage or parcels;
- (d) fix the general rates to be charged for the conveyance of animals.

In Section 41 of the Ordinance, its stated that the General Manager may prescribe special fares and rates for the transport of passengers and goods by rail, road, water or air services of the Railway Administration, not exceeding in any case the general fares and rates fixed

under Section 40 of the Ordinance. (Note: Before Independence (1957) MR also operated air and ferry services: MR provided lorries and trucks for the goods traffic too).

Passenger fares were initially set in 1956. Since then, MR made only two general fare revisions. The first was in April 1976 which increased the rate per km as follows:

|                              | <b>% increase</b> |
|------------------------------|-------------------|
| 1st class 10.56 cents per km | + 15.65           |
| 2nd class 4.97 cents per km  | + 13.47           |
| 3rd class 3.11 cents per km  | + 6.38            |

The second revision took effect from 1 August 1984 and the fare increases were as follows:

|                              | <b>% increase</b> |
|------------------------------|-------------------|
| 1st class 12.14 cents per km | + 15              |
| 2nd class 5.47 cents per km  | + 10              |
| 3rd class 3.36 cents per km  | + 8               |

Apart from basic fare there is also a charge of M\$3.00 for travelling on Express trains and M\$3.00 for air conditioned coach. Passengers on night trains pay an additional berth charge as follows:

|                         |   |          |
|-------------------------|---|----------|
| 1st class a/c berth     | - | M\$20.00 |
| 2nd class non-a/c berth | - | M\$10.00 |
| 2nd class (lower-bed)   | - | M\$8.00  |
| 2nd class (upper-bed)   | - | M\$6.00  |

Besides the ordinary fares, MR offers 12 special fares which offer 10%-50% discounts.



### 2.3.4 Financial Performance

The financial strength of a commercial enterprise can be assessed by four parameters.

- (a) Operating ratio: the ratio of (railway) operating expenses (before provision for depreciation, interest, debt charges, and income taxes) to the operating revenue.
- (b) Working capital ratio: the ratio of current assets to current liabilities.
- (c) Debt/equity ratio: the ratio of all long-term debt to the (railways) equity, including retained earnings.
- (d) Debt Servicing ratio: the ratio of net operating results (before depreciation, interest and taxes) to the (railways) debt servicing requirements. (Debt servicing needs to cover all charges for interest and loan repayments).

**TABLE 2.5**  
**MALAYAN RAILWAY**  
**FINANCIAL ASSESSMENT, 1982-86**

| Ratio                                            | 1982                  | 1983 | 1984  | 1985   | 1986   |
|--------------------------------------------------|-----------------------|------|-------|--------|--------|
| 1. Operating Ratio                               | 1.07                  | 1.01 | 1.02  | 1.09   | 0.82   |
| 2. Working Capital Ratio                         | 2.65                  | 5.87 | 4.26  | 2.98   | 2.64   |
| 3. Debt/Equity Ratio<br>(after accumulated loss) | 3.14                  | 5.65 | 10.18 | 146.35 | 247.60 |
| 4. Debt Servicing Ratio                          | DATA IS NOT AVAILABLE |      |       |        |        |

An operating ratio larger than 1.00 is undesirable as it indicates that the railway does not generate sufficient revenues to cover its operating expenditures. It means that no residual exists for depreciation, interest payments, and profits.

It can be observed from the above table that MR's working capital ratios are considered small because they are between 2.65 and 5.87, (ie. less than 6), the bigger the ratio the better, because it shows the ability to pay the current liabilities. The 'big problem' here is more than 50% of the yearly current assets is in the form of work-in-progress items. Since MR is offering services and not goods, those kind of assets, like track renewal stocks or coaches in work-in-progress, are not for sale but for their own use when ready.

The most stunning figure is debt/equity ratio which increased from 3.14 to 247.60. It means MR has financed its projects such as upgrading and maintenance programme – track improvement, rolling stock replacement and other physical improvements – by long-term debt (mostly from Federal Government) rather than from its own earnings. If this trend continues, MR is really in a serious debt position for which it is very difficult to find the solution, except for government to write-off that debt.

Therefore the three types of parameters available here indicate that MR is really in a dangerous financial position. The move to an effective strategic plan has to be done very soon.

The performance of MR should not be judged purely in financial terms as it brings other benefits to the country as a whole. It is a relatively safer and cheaper means of transport, especially in the inter-urban sector of the country. If MR services were to be stopped, a significant part of population, particularly the poorer section of Malaysians, would be badly affected. They have no private car to turn to, while the express coach service may be beyond their reach. The answer for them is still the railway service.



Among the three types of services by MR, namely: passenger, freight and parcel/mail between 1982 to 1986, the passenger section revenue contribution is the highest, (see table 2.6) and given the slow decline in freight it seems that the passenger service offers more scope for increasing revenue.

**TABLE 2.6**  
**MALAYAN RAILWAY PASSENGER, PARCELS/MAIL AND FREIGHT REVENUE**  
**1982-1986**

| Year | Passenger  |      | Freights   |      | Parcel/Mail |     |
|------|------------|------|------------|------|-------------|-----|
|      | M\$        | %    | M\$        | %    | M\$         | %   |
| 1982 | 60,058,665 | 48.3 | 57,825,883 | 46.6 | 6,336,354   | 5.1 |
| 1983 | 56,299,631 | 45.6 | 59,229,118 | 48.0 | 7,935,595   | 6.4 |
| 1984 | 59,983,702 | 48.3 | 56,246,073 | 45.3 | 7,940,863   | 6.4 |
| 1985 | 63,617,383 | 52.4 | 50,047,802 | 41.3 | 7,660,256   | 6.3 |
| 1986 | 62,889,763 | 52.3 | 50,321,958 | 41.9 | 7,011,961   | 5.8 |

Source: Commercial Department, MR.

### 2.3.5 Traffic Forecast

It seems useful to examine the traffic forecasting at this stage. (See figures 2.7 and 2.8)

The general approach to passenger forecast differs from the freight forecast in two ways:

- (1) The freight forecast is based on MR competitive ability to gain shares in certain markets, while the passenger side will be determined partly by competition and

partly by the social value placed on certain services, both by the localities they serve and the community in general.

- (2) The other difference rests in the nature of the two businesses where their market fundamentally differs. Passenger forecasts emphasise quality of service.

The freight traffic forecast for 1986 to 1990 is indicated in table 2.7 below:

**TABLE 2.7**  
**MALAYAN RAILWAY FREIGHT TRAFFIC FORECAST (1986-1990)**

| <b>Year</b> | <b>Tonnes<br/>( '000)</b> | <b>Revenue<br/>( '000)</b> | <b>Tonne Km<br/>( '000)</b> |
|-------------|---------------------------|----------------------------|-----------------------------|
| 1986        | 3,524 (2,860*)            | 63,000 (50,000*)           | 1,193,240 (1,0424,00*)      |
| 1987        | 3,697                     | 65,770                     | 1,242,640                   |
| 1988        | 3,891                     | 70,045                     | 1,318,540                   |
| 1989        | 4,090                     | 74,836                     | 1,386,650                   |
| 1990        | 4,346                     | 81,107                     | 1,447,850                   |

**\* Actual**

Source: Malayan Railway (1986), pp132



**TABLE 2.8**  
**MALAYAN RAILWAY PASSENGER TRAFFIC FORECAST (1986-1990)**

| Year | Passenger Journey<br>( '000) | Revenue<br>(M\$ '000) | Passenger Km<br>( '000) |
|------|------------------------------|-----------------------|-------------------------|
| 1986 | 6,599 (6,736*)               | 64,739 (62,890*)      | 1,406,328 (1,368,531*)  |
| 1987 | 6,772                        | 66,300                | 1,44,627                |
| 1988 | 6,987                        | 68,594                | 1,489,633               |
| 1989 | 7,174                        | 70,405                | 1,529,257               |
| 1990 | 7,363                        | 72,728                | 1,574,829               |

\* Actual

Source: Malayan Railway (1986), pp133.

**TABLE 2.9**  
**MALAYAN RAILWAY PARCELS AND MAIL FORECAST 1986-1990**

| Year | Revenue (M\$ '000) |
|------|--------------------|
| 1986 | 8,500 (7,012.1*)   |
| 1987 | 8,840              |
| 1988 | 9,200              |
| 1989 | 9,560              |
| 1990 | 9,560              |

\* Actual

Source: Commercial Departmental (1986), pp133.

Among MR's three services, the forecast put an optimistic estimate on freight revenue. The main reason for this, is that MR is now considering seriously an intermodal freight service.

This concept does not only provide door-to-door service to customers but also enables MR to operate freight trains with less intermediate stops, thus cutting down operating costs and journey time.

However, from 1986 results both freight and parcel traffic forecasts considerably exceed the actual out-turns (by much more than 10%). Forecasts for freight were 18.8% higher; revenue 21.4%, tonnes-Km 12.6% and parcel revenue 17.5%. On the other hand, passenger sector results showed less than 3% difference between actual and forecast; in fact, actual passenger numbers averaged 2% more than the forecast; passenger-revenue and passenger-Km were respectively 2.9% and 2.7% lower than their forecasts.

The important point to be noted here is that although the passenger numbers in 1986 increased by 5.6% compared to 1985, both revenue and passenger-Km decreased by 1.9% and 2.9% respectively (see Table C-1, Appendix C). This may indicate that more passengers travelled by the cheaper class (probably for shorter distance trips) compared with those of the previous year.

## **2.4 Conclusion**

MR was established more than 100 years ago but its monopoly power in carrying people and goods was diminished after 1970's. Since then they have struggled year after year to improve their financial position in order to be more self-sufficient, using all sorts of strategies, but never utilising the fare structure. Their competitors - road and air transport - seem to command more attention in national development financial allocation.

The situation became worse because not only is this organisation complex, but too many ministries and bodies control its management - these 'outsiders' are involved heavily in policy making. Although, in the Railway Ordinance 1948, it stated the rules and defined the powers of both government and MR top management, in practice the latter has been



given very much less authority. On the other hand, MR is supposed to operate as a commercial agency in business to earn profits. Government also put more financial burden onto MR through its Public Service Obligation, also the increment of any new salary scheme; normally announced by government every 4 years or in a shorter period, depending on the government's 'political mood'.

The passenger sector has an important role to play in MR survival, and this is indicated by the fact that, improvements to services over the last decade, (like offering better types of train and replacing old rolling stock with new coaches wherever needed for ordinary services) have attracted more customers to MR. The economic recession which started sometime in 1985/86 also affected MR operation, but with the new, improved outlook for the state of the national economy, MR is also expected to recover soon.

Since under - utilised services are available within present resources (sometimes up to 50% of seats remain empty in every run of some services), it may be possible for MR to enhance its financial performance by means of more flexible fare policies, which is what this thesis aims to discover and explore.

## CHAPTER THREE

### METHODOLOGY AND SOURCES OF DATA

#### 3.1 Introduction

The aim of this chapter is to provide a critical description of sources of data and methods of analysis used to assist reappraisal and development of the concept of fare elasticity of demand, with particular application to the alleviation of financial problems besetting Malayan Railway.

The intention is to provide adequate insight for the reader to judge the validity, reliability, limitations, strengths and usefulness of the outcome in terms of estimations of elasticity, and to measure the appropriateness of elasticity as a tool for improving MR profitability.

Initial research showed that although the concept of fare elasticity would perform a major role, it could hardly be used in a rigorous, mathematical manner; not only because of the innate complexity of railway systems in general, eg. market fragmentation in terms of services, schedules, classes, concessions peak and off-peak etc., but because of a lack of data about MR operations, especially about variations in demand for its services.

It was decided accordingly that the main method should be to devise an experimental, grounded approach enabling MR to manipulate its fare structures in order to increase revenue contributions and to adjust fare structures to match changing demand on an on-going basis.

Best guideline estimates of fare elasticities of demand were derived from a comprehensive literature study, but results obtained many years ago on outmoded



railways in other countries with highly developed economies might today seem inadequate in their conceptual framework and also non-transferable, especially into the unique socio-economic situation of a developing Asian country.

Accordingly the researcher extended the framework of research to include three opinion surveys which would supplement information obtained from MR records. Interviews were also undertaken with well-known researchers and writers, currently working in the field of transportation in Britain, who were able to provide information and guidelines concerning current practices in methodology and its implementation.

All these data sources were noticeably limited both by the contexts in which they had been developed and by the systems to which they referred. Without an established practice of elasticity estimation in the MR situation, it was important to ascertain the levels of risk involved in fare changes of a modest size, and it seemed best to begin this process of action learning by means of a feasibility study.

In the MR research situation, the complex schedule of MR services encouraged the segmentation of passenger services into differing estimated 'elasticity groups'. This enabled the simulation of the effects of fare changes upon revenue contributions to be calculated according to estimated elasticity ranges for specific types of services over successive time-periods.

It is then up to MR to analyse the results of a period of experimentation involving selective fare changes; then to experiment further so that it can develop even better estimates of fare elasticities based on actual changes; and hence it can find its 'best' revenue position.

This proposal appears to circumvent some of the drawbacks of the method ie. the retrospective nature of estimates; their ever changing context; the rapidity of short-term changes in actual elasticities of demand (as distinct from more stable medium-term averages comprising a trend); delays in both implementation of fare structures and adaptation to change by the travelling public; nevertheless, like other results, MR elasticity estimates will also be specific to the then current situation.

### **3.2 Grounded approach**

A major source of data for this study was fieldwork in Malaysia. Three months were spent in 1987 and another two months in 1990 in Malayan Railways, particularly in the commercial department, financial department, MR library and on trains (for the survey). The objectives of the fieldwork were to:

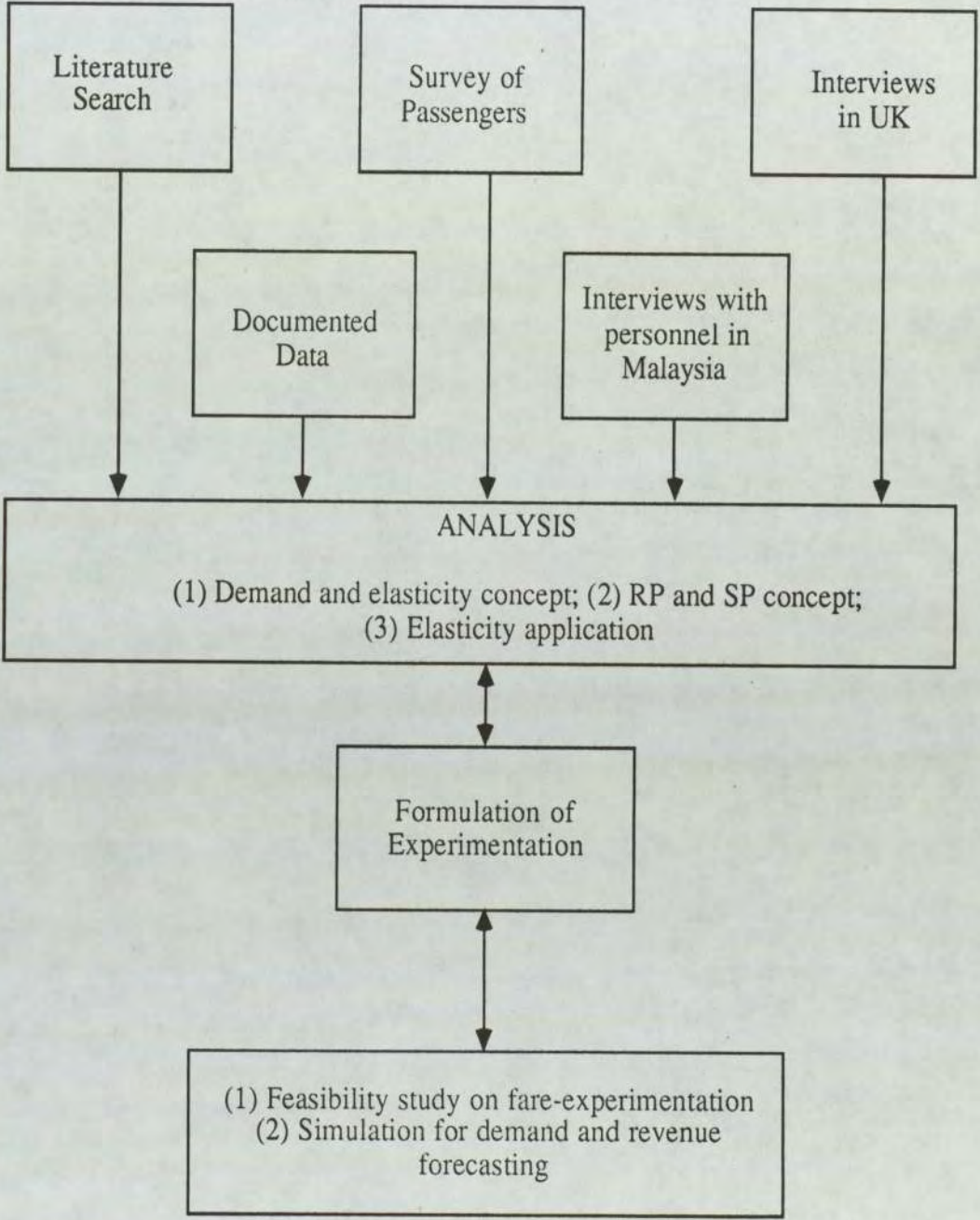
- (a) Study the organisation in general
- (b) Search for the relevant data such as revenue collection, costs, and rate of train occupancy.
- (c) Interview the relevant personnel in MR in order to find out about their planning and policies, particularly towards passenger services (fare and quality).
- (d) Conduct three surveys on passengers. The first survey used mainly RP methods with the introduction of a small amount of SP methods. The second one had more questions based on the SP approach than the RP. The final survey was based totally on the application of SP methods.



Data was collected in the following ways (see figure 3.1)

1. Survey of literature
2. Statistics of MR 1984, 85, 86 and 1987
3. Survey of passengers
4. Interviews with MR personnel
5. Interviews with other researchers

FIGURE 3.1  
SOURCES OF DATA AND STRATEGIC DESCRIPTION OF METHODOLOGY





In the case of the literature survey, this research consisted of examination of the elasticity concept as revealed in books, articles, theses, and transportation documents; most of it was accomplished in the first stage of this study, although it did carry on throughout. From it were derived elasticity measurements from previous work, pricing and costing in other railways, together with help in methodology, data collection, interpretation and analysis.

The search was not straightforward. Problems encountered in MR were that references were already two years out of date by the time that they appeared, and a number of records were lost in 1985 while in transit (between the former premises of the commercial department in Brickfield Road, Kuala Lumpur to Headquarters in the Hishamuddin Road). The extant records were not found to be in a suitable condition for feeding into a computer, and had to be transcribed by hand in summary form.

It was difficult to obtain material from the MR library at Sentul, where the MR workshops are located, due to a breakdown of communication between departments 7kms distant from each other. Also, it proved next to impossible to get documents from Malaysia through the mail. The only way to achieve any result was by personal visit and request.

Some reports are not available either through the British Library or other UK sources, and/or cannot be traced from their countries of origin (eg. Malaysia, Australia, Sweden, and Canada). These articles which are to be found show upon closer inspection just the result of elasticities estimation and fare adjustment, without mentioning **how** they were derived. Indeed, some railway organisations (eg. British Rail) consider their methods to be “confidential” for some undisclosed reason – a stance which seems hard to credit or sustain.



All the above factors are considered as external limitations imposed by circumstances upon the full scope of this research.

While these findings proved useful as a general indication of the ranges of elasticities found in the past in other areas of the world, only the results were given, and no study actually demonstrated how they were arrived at. Few even mentioned the type of elasticity used, which was generally taken to be the point fare elasticity of demand, rather than the arc elasticity from which a mid-point could be chosen.

Another major constraint was that nearly all the literature examples come from developed country railway systems; only one relating to developing countries was found in the libraries: a Third World entry (from Zimbabwe) found in a limited circulation published report handed to this researcher by another.

About a quarter of the library search was completed in Malaysia during the fieldwork for the background of the country's transport system, both in general and in order to deliberate the MR problem areas relevant to the thesis. Many of the previous works were published long ago; even more recent ones were up to a decade behind the times; only a few of them are contemporary.

Data was collected from 1984-86 and for the first six months of 1987. The year 1984 was chosen as the starting point since in that year was the latest fare review and increase, and the information was still accessible. The previous review data was stored 'on file' somewhere in the commercial department, but unavailable.

Rate of occupancy data for 1987 was collected in 1988 by a group of students, who utilised summary sheets prepared in such a way as to yield information on time of day and service involved, as was directed. Time constraints have meant that not more than one year's figures have been collected, but at least this comprised a practical



demonstration of what could be done for subsequent years. Before the fare experiments start, that exercise could be repeated (for 1988-90, for example).

Another weakness of all data collected from an operating system is that it soon becomes 'old', and therefore not of much help in estimating current, let alone future elasticity of demand. Besides which, the quality of service also changed when the fares increased in 1984, and a continuous programme of improvements to stations and on trains also has had some bearing on demand.

Accordingly, in Malaysia, not only were information and data gathered from documentary services - including material from a sample survey of train passengers' opinions regarding the quality of service and the level of fares, (to be discussed shortly) - but most importantly from open interviews with a number of personnel in MR. Although these managers were obviously immersed in the present MR organisational culture, they were forthcoming about both short and long-term plans and their views of market segmentation, especially regarding peak and off-peak periods of travel, were helpful.

Another interviewee on one occasion was the operations manager of the National Bus Company (NBC), now privatised as a subsidiary of Maraholdings and run on commercial principles. (Maraholding is a semi-government body which was set-up in 1955 to help the Malay population in education and economic development). Its operations manager moved from MR to his present post, and thus was able to compare two very differing situations and to contrast the different management styles practiced by MR and NBC - rival organisations in the mass transportation passenger markets.

A further series of interviews were held with two independent transportation researchers in Britain in order to verify methods used for obtaining estimates in calculating the fare



elasticity of demand from the raw data, and thus also for clarifying the elasticity concept. It seemed important to discuss with eminent scholars (see footnote)\* problems surrounding the practice of estimation in the context of developing countries, since only one practical example of this had been found (Zimbabwe), and MR certainly appeared to have a big problem concerning the level of revenue contribution from passenger services.

Mention has already been made of a passenger opinion survey. Its initial objectives were to find out:

1. Background information concerning the travelling public.
2. Indications of the type of market that MR in fact has
3. A sample of passenger opinion on fares and the quality of service on MR, and particularly their:
  - (i) willingness to pay
  - (ii) willingness to travel by train
4. The perceived quality of service and fare compared to other types of transport.

From the above, the resultant objective was then to analyse and forecast whether there is a possibility for MR to increase market share and at the same time to increase revenue.

---

\* Mr Peter White of the Polytechnic of Central London and Dr C A Nash of the Institute of Transport Studies, University of Leeds. Both provided much invaluable information and advice concerning both the theory and practice of elasticity in transportation research.



All the above provide useful findings for the thesis, despite their limitations and weaknesses, and serve to establish trends in demand where previously such vital management information has been totally lacking in MR. The limited time for carrying out the work, limited funds, lack of training for the enumerators and a residue of unanswered questions on some of the questionnaires mean that survey results should be regarded with some reservations.

Perhaps future surveys, which in any case should be more comprehensive than the pilot survey guiding the experiment, ought to carry more questions regarding the fare and its impact. Other aspects appear to have been fairly adequately represented.

Information and data derived from the several sources described above will, despite their limitations, be those used at the stage of economic analysis, for they appear to be the best obtainable evidence and represent an advance on the previous position.

In the economic analysis, price (or fare) elasticity of demand is the focus of enquiry; from the data made available by the various means described will be derived elasticity estimates, upon the basis of which future fare changes may be determined.

Clearly, there lingers some doubt and risk attached to fare changes derived from the available data and from the mutable opinions expressed through the sample survey. Therefore the next stage is to formulate a fare experiment and to present it to MR as a feasibility study that actually requires not just to be read but to be implemented, if MR are to be helped to improve their financial position.

Some recourse to computer simulation/programming will produce a series of fare changes, each with its own elasticity of demand parameters, and each having a calculable effect on revenue. The experiment will test these estimates in real terms.



### **3.3 Background to Approach and Methods**

#### **3.3.1 Nature of problems**

At the beginning of its establishment, MR enjoyed monopoly status in transporting people and goods in Peninsular Malaysia. Unfortunately, in the last two decades the importance of railways has reduced gradually due to the rapid improvement in roads and highways which led to easier access to the interior for road transport. Government planners have put very high emphasis upon developing new roads, highways, and ports as well as air services, whereas the railway has become more or less “forgotten”. The latter remains a state-owned agency. Road public transport and air services, on the other hand, are run by private operators or organisations.

MR is an example of a government agency which is earning money: yet it normally requires subsidies from government to support its operation. This study will try to show:

- (a) To MR that they are able, by using all available resources, to improve themselves, (in terms of revenue) through their fare structure, and thus reduce or eliminate dependency on subsidies.
- (b) To the Ministry of Transport that it is important to allow more freedom in decision taking to a government agency which makes money so that the organisation can compete in a “healthier manner” in the open market.

A major problem of MR is its relative lack of experienced managers having authority to take whatever steps are thought necessary to help rectify the overall financial loss



position. For example, over the last fifteen years, a situation has been allowed to arise and has persisted uncorrected wherein operating costs have increased but insufficient revenue has been earned to cover outgoings. This has caused MR to operate continuously at a loss and therefore has incurred subsidization from taxes, which in turn has meant political ties upon the hands of MR commercial managers, and no solution to the problem.

After considering a number of possible approaches to help resolve this unhappy state of affairs in MR, the researcher decided to tackle the problem through manipulation of fares in order to increase revenue, and this meant using the elasticity of demand concept in some form or other.

A major constraint immediately affecting this proposal was the limited amount and sometimes poor quality of data available, but the researcher felt reasonably confident that from existing MR data and by looking at other railway systems, some acceptable initial estimates of elasticity could be made.

The next step would be to devise a means of MR gaining more accurate estimates of elasticity, and here it was decided that an experiment offered an appropriate solution. Existing data suggest that there is scope and opportunity for increasing revenue by both upward and downward adjustment of certain fares on selected services. Periods of peak and off-peak travel demand result in seat occupancy rates varying from very good down to only 20 percent of the available accommodation.

During the peak period which is normally Friday to Sunday (considered as medium-peak), public holidays throughout the year especially before and after Muslim Hari Raya and Chinese New Year, and the last two months of the year, the demand appears to be inelastic (less than  $-1.0$ ). Within this period some travellers are willing to stand on a train for about six hours journey if they unable to get a seat. In fact tickets were sold out



one month before the two big events (the religious celebration) although during these times MR provide extra services. The public cannot turn to other alternatives because all of them, including air services, were fully booked.

On the other hand, during off-peak times (which are other than periods mentioned above), the railway service is quiet. Travellers have other alternatives such as bus because the latter offers a shorter journey time though in terms of fare, bus and train are almost the same. If we examine it carefully, this situation highlights precisely the all-important element of fare elasticity of demand (or at least cross-elasticity). Take for example, a journey of about 300km distance with lets say M\$17.00 fare either by train (third class, ordinary service) or bus, train takes 7 hours and bus only needs 5 hours to reach the same destination, thus the latter offers a more cost-effective service. In principle, the intention is to increase fare where demand is inelastic and lower fares where it is elastic.

### **3.3.2 Fare Revisions Process**

We now have to look at the existing pattern and predict what might be the future pattern of demand from a revised fare structure.

The process will be:

- (i) Look at the trend of revenue and expenses as a whole for the last decade in the passenger sectors.
- (ii) Study whether there exists potential to increase market share by improving utilisation of present resources.



- (iii) Relate resources to the fare by using the variability in consumers' expressed need for transportation. **One possible method here is to measure the fare elasticity of demand, forecast the market and then calculate revenue within a range of elasticity and a range of fare increases.**

Since no similar work has been done before in Malaysia, we need to use other railways' elasticity estimations from which to formulate the fare experiment for MR. There exist both constraints surrounding all elasticity estimates and also specific reservations concerning the special circumstances of MR. The management might take it as a learning process - action learning by systematic "trial and error" followed by systematic fare modifications.

MR management need to get into a learning situation whereby practical experience of fare changes and revenue monitoring can be gained. Always assuming that a change of fares policy could be agreed, it was thought that the proposed limited exercise in fare experimentation would increase operational managers' recognition of both the real problems that exist and of their possible resolution.

### **3.3.3 Statement of suitability of adopted procedures**

Although the ticket sales record can provide a considerable amount of data, there exists significant limitation where cash paid data are recorded, for this will not usually cover the trip purpose, car availability, other public transport availability, income, age and reasons for travel by train. For these, an in-vehicle survey is generally required. However, this tells us little of public transport market share or users' response to the new products (new facilities or services offered or about to be offered) or about the new fare required to cover the operators' expenses. Therefore it seemed that a household survey should be conducted to see the response of the public to the planned service.



This is called "stated preference" methods and is one which will be suggested in the experimental approach.

### **3.4 Data Sources**

#### **3.4.1 Literature search - aims and summary**

Literature search was used to explore and analyse the development of MR, to examine performance of other railway systems and to see if other studies provide some means of estimating elasticities for MR.

It was found that variations of the elasticity concept had been in use since 1940's and were traced in studies of transportation systems all over the world. Response of demand was commonly measured against explanatory variables such as socio-economic factors, quality of service, and, of course, fares, and this was universally found to have some general practical value for management.

Until the early 1980's, studies concentrating on the fare elasticities of demand showed that the revealed preference method was the one used – that is to say, data from ticket sales, concerning **past** events, was used to calculate elasticities. Methods of analysing elasticity of demand using revealed preference, including time series analysis, cross-sectional analysis and generalisation costs methods. These studies ignored the changing complexity of demand in fragmented markets .

About ten years back, transportation researchers started applying the stated preference method, whereby target groups of passengers are questioned about their **future** plans for travel and their current preference regarding a number of hypothetical fare changes, or quality differences, which may be introduced.



Passengers are put in the position “if” the fare changes or the quality level changes, what will be their reaction to travel or not to travel by that particular mode? “Yes” answers are then compared to “present” demand in order to obtain percentage changes, and this is divided by the “planned” fare changes to yield the fare elasticity of demand.

According to KROES et al (1988) – SP methods are a family of techniques which are individual respondents’ stated about their preferences in a set of transport options to estimate utility functions. Such statements are tinged with theoretical euphemism, for in practice people’s veracity of response is to say the least questionable; moreover, they maybe misled by both questions, their perception of the intention underlying the interview, some minor consideration of their own position vis a vis this intention, and a host of subjective valuations which underlie their responses and are never disclosed.

Four well-known methods are considered as forming part of SP:- conjoint analysis, functional measurement, trade-off analysis and transfer price method. The first three methods refer to the uses of an experimental design procedure to generate transport options for appraisal by respondents, while the transfer price method is less widely used because it differs in a number of respects.

In the United Kingdom, emphasis on these SP method started in from 1979. In the early period of application, respondents expressed their preferences by rank ordering or scaling; but nowadays the questions are put in a behavioural choice context and they can choose only one alternative, for example, "If you were to have these alternatives available to you, which one would you choose?" In the most recent development, respondents are offered combinations of a few alternatives (typically two to five) and are asked to express their choices either by indicating one chosen alternative or by assigning subjective choice probabilities to each of the alternatives.



In a developing railway system like MR, none of these methods have ever been used before. In fact they did not even use RP methods, because there was no fare elasticity measured or applied before in this transportation system. Based on this, the researcher can undertake application of elasticity measurement only by estimation. After a certain period of experimentation using either one of the methods (RP alone or SP alone) or a combination of methods, one may come out with a suitable method of fare elasticity measurement for the Malaysia Railway System, and use it to forecast demand and to estimate revenue from any future changes in fare.

SP methods have proved useful in many transport areas. Here are some examples of application in advanced railway systems which might help in setting the fare experiment in Malaysian Railway.

**1. Derivation of demand elasticities amongst Intercity Passenger (Sheldon & Steer 1982) - conducted on behalf of BR.**

*Area:*

Establishing a frequency demand elasticity for Intercity rail travel in Britain. There were three variables included in the research: journey time, frequency and fares.

By applying SP methods this study was able to overcome the problem of distinguishing between frequency and journey time. In the existing RP models both variables were subsumed within the same generalised cost formulation.

Elasticity were derived by relating the estimated utility weight ratio to a 'known' journey time elasticity obtained from revealed preference data previously analysed. The analysis was carried out using the MONANOVA program on a disaggregate basis and the market



group results were obtained through summation. The conclusion was that it was very useful to breakdown elasticity by distance (over and under 125 miles) and purpose.

| Purpose  | Fare | Time* | Frequency (Trains/hr) |
|----------|------|-------|-----------------------|
| Business | -0.7 | -0.7  | +0.2                  |
| Optional | -1.4 | -0.5  | +0.2                  |

\* These estimates were given (provided from revealed preference models).

2.     **Examination of Passenger Investment Priorities Conducted on behalf of Danish Railways (1986).**

The objective was to establish and quantify the relative importance that passengers attach to changes in various features of rail travel.

SP methods were used to give importance weightings for each variable. Then the weighting was translated into elasticity (demand change) value by linking importance weightings to a 'known' elasticity - in this case - fares.

This is used for an action plan for the forthcoming 5-year period and for each specified action, the estimated demand was calculated using an average fare and revenue impact.

Trade-off analysis was used to test the effects of different station improvements and to quantify the revenue benefits from which an investment has been justified.

## *Conclusion*

- (a) The market as a whole appeared to be prepared to pay around 22.5 percent more on fares for a 20 percent improvement in journey time. This gave a fare elasticity of  $-0.9$ .
  - (b) On catering, passengers showed a preference for basic facilities.
  - (c) By breaking the market down into its component parts it allows one to identify which aspects of the services would benefit from being given a higher profile for different target markets.
3. **Derivations of Long Distance Travel Demand elasticities directly through choice modelling technique (1986) - conducted on behalf of BR.**

The broad objective of that project was to extend the conjoint analysis framework into a method which could enable elasticity values to be derived directly for long-distance intercity travel by rail.

Standard linear LOGIT models were calibrated, from which a micro-simulation model was developed marketing (rail and competitive) scenarios. The result is considered very plausible. For instance, the effect of 10 percent decrease in the rail fare was predicted to result in a 16 percent increase in the rail market, implying a fares' elasticity of  $-1.6$ .



**4. An application of computer-based SP to study mode-switching in Netherland (1988).**

*Objectives:*

To assess the possibilities for increasing rail patronage for intercity travel from the small cities to the largest cities.

This was done by means of a random telephone survey in Nijmegen where the willing respondents were interviewed at home at the later stage. The rail service attributes for study were, fare, journey time, number of interchanges and the level of comfort. SP methods were applied in this study with the aid of a Zenith Z-181 portable computer. The computer software enabled the researchers to conduct interviews, analyse data and obtain results immediately following each interview. If the respondent was not consistent in their choices or preferences then the computer was unable to give a result. In such cases the interviews could be repeated immediately.

As a basis for comparison, they had two previous studies carried out for Netherland Railways, based on more traditional SP Survey techniques.

**5. Investigating the passenger demand for High Speed Rail in Australia - 1988.**

*Objective:*

To integrate Revealed Preference (RP) and Stated Choice Data (SP) for Very Fast Train (VFT) in Australia - Sydney, Canberra and Melbourne using Time-Cost trade-off choice experiment. A procedure for determining the problem of an individual selecting a mode of transport out of the offered set.



Five modes (car, plane, train, coach and VFT) and two attributes travel time and cost were investigated. The aim of the experiment is to provide the data necessary to identify the relative positioning of the VFT and the other modes in respect of the marginal utilities attached to each of the travel attributes. This knowledge of positioning can then be used to adjust the travel demand model estimated using the RP data.

These five cases show that SP methods have been tried extensively on four established railways networks (two of the five cases are from BR). Although they were applied separately the demand studies for the Australian VFT (Very Fast Train) used both RP and SP methods.

The basic objective in all five cases was the attempt to estimate the elasticity of demand and to forecast the market for future operations. The fact that SP methods have been applied to national railway networks is strong evidence for their utility. On this basis we can strongly recommend that these methods would probably also be useful to MR by means of similar experiment.

The disadvantage of SP methods arises from the fact that they are based on respondents future intentions. However, a proportion of respondents will not necessarily carry out their originally stated intentions. This problem may be overcome by using RP methods based on existing behaviour as a validation test. (See for example, KROES et al, 1988; WARDMAN, 1988).

Thus to claim that a combination of revealed and stated preference methods yields an ideal solution and a sound basis for estimating future fare elasticities of demand is inherently untenable. Nevertheless, for all the imperfections, such a *combination of methods* appear to be an improvement upon reliance on RP alone, or upon SP alone,



since by repeated experimentation, experience is gained on how these two differing estimates can be reconciled, or proximated. A margin of error may even become detectable over time, and that would prove useful in interpreting calculations.

Literature search is also important in providing ideas regarding the survey design in terms of format, scope, suitability in operationalisation, dealing with fieldwork teams, choice of samples, measurement of reliability of answer, preparation of the questionnaire and analysing data.

#### **3.4.2 Interviews with established researchers**

One of the best way to obtain the knowledge and information is by talking to the established researchers. Mr Peter White was approached after discovering his work on transportation in Malaysia; he was teaching in an Institute in Kuala Lumpur for sometime in the early 1980's. Mr White also has done some work in Zimbabwe and Bombay. Dr Nash is current editor of the Journal of Transport, Economics and Policy, a senior lecturer in the Institute of Transport Studies, Leeds University as well as working with British Rail. Their opinions and suggestions have helped a great deal in this study especially in understanding the concepts of elasticity and stated preference methods.

#### **3.4.3 Documented data**

Two data sources fall under this category, namely the Statistics Department of Malaysia, and MR, from which come the raw data on revenue, passenger numbers, passenger Km and rate of train occupancy.

**(i) Data from Statistics Department**

Data includes population by sex, ethnic groups, and state with population projection up to year 2000; principal statistics of bus, taxi and road haulage, their revenue and expenses, and motor vehicle registration 1983-86. This data will be used indirectly for the MR passenger forecast. In order to update those data we will use some statistics from the fifth Malaysian Plan (1986-90) – (employment, income and age component of population).

**(ii) Data from MR**

Statistical data from the Commercial Department has been gathered in order to see the trend in passenger numbers, passenger km and passenger revenue for 1984 until the first half of 1987. The researcher was working in this Department during her three month field work from mid-July to mid-October 1987 and another time in February and March 1990.

Another set of data from the same Department is the average seats offered and seats taken during a year classified into different times of the year under different types of classes and services.

It shows that there exists good opportunity to introduce special offers (discount tickets) to attract more passenger to fill the seats in certain seasons of the year. MR data also has evidence of more passengers choosing the more comfortable service even when the fare is higher than the normal service.



Those statistics provided by the Statistical Department, and by the MR, plus the number and ethnic components of population projection, will be our guideline for the future demand on transportation.

#### **3.4.4 Interviews with personnel**

Four interviews with personnel were carried out during the field study and one with Maraholding operations manager, as explained earlier in this chapter. The aim was to compare MR with its main competitor in public transport - bus express - in respect of both their present achievements and future prospects.

According to the Maraholding operation manager, railway operations (MR) do not put much emphasis on consideration of profit and loss, whereas this is the main aim in the bus operation. The long-distance bus service emphasises comfort and safety, and the short-distance concentrates on speed, reliability and frequency. In order to increase revenue, (during economic recession) their strategy is reducing costs by reducing wages, paying attention to proper maintenance and efficiency, and reducing leasing costs.

In their plan, if economic growth has risen by 5% or more by the early 1990's, passenger services will be increased by about 5-10% but if growth has slackened they will decrease their service accordingly. In the normal day, the average loading (rate of occupancy) is about 70%. Conducting a survey on the public is the normal method for them before they introduce any new service, *but there still exists no study measuring any kind of demand elasticities.*

Those MR personnel giving their opinion included the deputy general manager 1, director of the Commercial Department, director of finance, the manager of the passenger



sector and the ex-manager of this sector, then attached to the training section of MR. Findings from these interviews are incorporated in many parts of this thesis.

It seemed important to get some written information from formal and informal discussion with them. They revealed their opinion, hopes and prospects of improving MR operations as well as making financial improvements. Their personal experiences in the operation can assist in forecasting the market at least for the medium-term – 5 to 10 years. To be efficient and – productive, MR needs more freedom in making decisions; in fact, the majority of personnel are strongly agreed with the plan to privatise MR.

#### **3.4.5 Survey**

Survey research is a set of orderly procedures specifying what information is to be obtained and from whom and how. Due to lack of suitable data, market and opinion research techniques were used to provide the necessary information. Three surveys of people travelling on certain long distance rail services were carried out in order to determine their reactions to a given quality of service and to hypothetical discounts on fares. Those surveys were conducted in Malaysian Language as shown in Appendices, E-1, K-1, and L-1. In this section we tend to discuss in detail only on the survey of 1990. The other two surveys will be detailed in Chapter Six.

Through the survey, we are able to gather some information concerning consumers' preference, habits and travelling plans, which were unobtainable from documented data. Although one cannot estimate precise elasticities from the percentage response to questions, the sample preference (or majority preference) can be used as a guideline in order to approximate elasticity.



Preference here refers to two distinct categories:

- a) Preference among attributes of the train service, for example fares and other factors in the quality of the service.

(Refer to questions 41 to 49 in Appendix E).

- b) Preference among modes of transport by comparing fares and other elements of service.

(Refer to questions 52 to 62 of Appendix E).

The primary objective of the survey of passenger opinion was to obtain first-hand, current information about the travel behaviour characterising the present MR system. This was done in order to assist in the estimation of demand elasticities in the aftermath of a proposed series of fare changes.

Details of the preferences surveyed included:

1. Passengers' opinions on fares and quality of services (are they satisfied with the present level).
2. What are the main elements of quality of service they look for.
3. What they require from the service, both at the station and on the train.
4. Which class of service experienced higher levels of demand, and which lower.
5. Which market has better prospects: long distance or short distance.
6. Seasonally in demand, as in peak, off-peak times within a day, a week, a month, a year.
7. Whether rail services are in demand or have good prospects compared to other modes of passenger transportation.
8. What main journey purpose is popular among train travellers.

9. What makes train travellers reluctant or prevents them from travelling by train in terms of quality, fare, their attitude and so on.
10. Awareness of customers through promotion.

(Note: the 1987 survey questionnaire is to be found in Appendix E).

Some assumptions were made and it is necessary to state those in order to validate the responses. First of all, we assume that consumers' preference is rational. Secondly, it is assumed that respondents were well informed about every aspect of MR fares and services. In reality, neither may be the case.

However, there exists another limitation inherent in the survey: viz, passengers may not necessarily know in advance what their actual reaction and behaviour will be towards fare changes and variations in the quality of services. This is one of the reasons why it is suggested that a series of surveys are needed to gauge market response from time to time because three or four similar approach of surveys following the initial experiment on the same group of passengers (sample) in a year will lead to more accurate elasticity estimates.

#### **3.4.5.1. Population and Sample**

With the intention of reducing sampling error and also bias, this survey follows the normal sampling processes, as indicated below, although the method used is random sampling.

- Step 1: Define the population, which includes the element, sampling unit, area covered and time.
- Step 2: Identify the sampling frame from which the sample will be selected.
- Step 3: Decide on the sampling size, and how many elements to include in the sample.
- Step 4: Select a specific procedure by which the sample will be determined.



Step 5: Physically select the sample based on Step 4.

The population for this study are the train passengers using the West Coast mainline from Butterworth to Singapore. Total passenger flow is defined as:

$$\text{Total flow (F)} = \overrightarrow{AB} + \overrightarrow{BA} + \overrightarrow{AC} + \overrightarrow{CA}$$

where A is Kuala Lumpur

B is Singapore

C is Butterworth

It was decided to include all the flows to determine traveller characteristics, but specifically to look at the principal flows for the purpose of market segmentation to determine price elasticity of demand.

Usually, the sampling frame can consist of a list, a register or a map of the population under study, but in this case the sampling procedure does not require a list of sampling units, because the samples were chosen from the train passengers (population).

The most suitable approach to adopt here is area sampling, which refers to train route as area. It relies heavily upon getting the chosen respondents to co-operate. To make the survey more emphatic and significant (i.e. meaningful) the stratified sampling procedure was designed to be applied, because this method normally results in reducing the standard error of the estimator (although this may not be true in all cases).

In 1986, the total number of passengers using MR was about 6.735 million, two-thirds of them from the mainline service, Butterworth to Singapore. The balance were from the East Coast Line, together with other branch lines; therefore, the total passenger number for the mainline was about 4.412 millions. Out of this total figure, 420 samples were



chosen, but unfortunately 16 of the replies were questionnaires considered to be damaged because more than 20 per cent of the questions remained unanswered. In the end, only 404 questionnaires were passed fit as the total sample size to be analysed for this survey.

Although, as the passenger statistics for 1984-86 show (Table 5.1 ), third class continued to enjoy the biggest share with more than 70 per cent of passengers, second class had 20 per cent to 28 per cent, but first class only 1 per cent of the total for the whole system. The West Coast mainline provided the highest number on second class rail services, followed by third class and then first class through provision of mail train, night sleeper and express services. (Other lines do not have night sleeper or express services).

The original plan for the survey was to stratify the sample according to a class of service ration of 1:2:3 for first, second and third classes, but practical experience led to substitution of systematic random sampling. In this method, respondents were chosen from every fourth passenger in the second and third class and from every second passenger in the first class, based simply on the interviewer's observation and counting. In this way, a properly representative sample was obtained. At the end of the survey period, the results obtained were 31.2% from third class, 62.9% were from second class and the balance of 5.9% were from first class.

In order to make the sample adequate enough as a basis for making estimates of population parameter, it was derived from the three classes of service combined with three types of ticket and of train. The resultant list is as shown of page 120 & 121. The four days chosen for the survey period were Thursday to Sunday 1987: i.e. two weekdays and the weekend days. Costs helped determine both size of survey and the number of days.



The plan was devised accordingly, as follows:

|                                         |                         |
|-----------------------------------------|-------------------------|
| 10 interviewers x 10 interviews per day | - <u>100</u> per day    |
| 100 x 4 days                            | - 400 interviews        |
| Interviews by researcher                | - 20                    |
|                                         | <hr/>                   |
|                                         | 420 total sample units. |
|                                         | =====                   |

The time spent to approach and obtain a successful interview was on average 45-60 minutes. (For further discussion on sampling error and bias cf: section 3.5.).

**3.4.5.2 Questionnaire Design**

Questionnaire design took the form normally known as structured - direct, which required that the questions be asked with exactly the same wording and in exactly the same sequence for all respondents. The greatest advantage of this approach is simplicity in its administration and ease of data processing, analysis and interpretation.

For the purpose of reducing interview bias, cost and time associated with data processing, the questions were not only structured - directed but also in the form of multiple choice answers. The respondents chose one answer in the questionnaire, but on other occasions they were free to answer more than one of the alternatives presented.

**3.4.5.3 Pre-test, Revision and Final Draft**

About one month before the actual survey, a pre-test was carried out. The aim of that exercise was redesign the questionnaire wherever needed, to estimate the time required for each interview, and to estimate the total time and cost for completing the survey. The pre-test was also used for measuring the adequacy of the sampling frame, the suitability of the



method of collecting data, the efficiency of the instruction and general briefing for interviewers and also the efficiency of the organisation on the field.

Fifteen interviews were completed by the researcher and two assistants who later became included in the actual survey interview team. The passenger service sector manager of MR and his Deputy also went through the questionnaire, and some additional guidance was provided by a professor in marketing research of the National University of Malaysia as a result, a slightly redesigned questionnaire was drafted for the actual field survey, as shown in Appendix E.

#### **3.4.5.4 Communication Method, Interviews and Training**

A face-to-face interview was used as the communication method for this survey. The interview format was considered the best method in terms of highest response in comparison with either observation, mail questionnaire or telephone interview. As each questionnaire contained more than sixty questions, the latter alternative was ruled out on grounds of cost alone. In addition, Malaysian travellers are still unaccustomed to surveys which aim to test their opinions about train services. (There were three previous surveys done by students from an Institute, but their course project was entirely dissimilar from this survey).

Another reason for choosing this method was that the interview is a social process involving two individuals, the interviewer and the respondent. The interaction between them is important in ensuring that the respondent is willing and able to provide the required information: the interviewer may also motivate the respondent to give as accurate answer as possible.

There were ten interviewers, comprised of some graduates and some final year undergraduate students from the National University of Malaysia (UKM). They had



gained some previous experience as enumerators for other UKM researchers projects. They were all briefed and allowed one hour's practice session, achieved through interviewing their colleagues.

This was an economical solution to the cost/manpower problem, and fully in the spirit of a top-level MR interview, in which it was declared:

*"We have tried some approaches such as marketing research and organisation studies but the result is not very encouraging. We have to try something which would not cost us very much by using available resources".*

*Mr Rahim Osman - MR Deputy General Manager, 1 October 1987.*

The rate of response between first, second and third class passengers also varied. In the first class, the respondents were not approached from every fourth but from every second passenger, because once they were in their sleeping berth (on the night train especially) they did not like to be disturbed. It was consequently, not easy to approach them. For this reason, some interviews were done at the station while waiting for the train, whenever the interviewer discovered which class travel had been booked by the prospective respondent.

A language barrier problem also existed. Some passengers who were approached would have liked to have been interviewed but they understood only their own language (Chinese or Indian), whereas the interviewers only spoke Malaysian or English.

Response error may have occurred through interviewer's bias, carelessness in recording the answer, or when interviewers themselves mistakenly left some questionnaires to be read and answered by respondents without interview. Another type of error, known as systematic error, occurred when respondents for some reason or another felt themselves reluctant to admit their real feeling or opinion about some of the questions. Numerous



authors of social investigation studies have noted these phenomenons and concluded that errors of the first and second types may balance themselves out, still leaving some residual bias, overall.

A part of respondents' unwillingness to give a correct answer or in some cases inability to answer correctly, may have been due to some weakness in the questionnaire design, or equally to some weakness of the interviewer. These are the basic problems of any survey, because it is an interaction between two people who may affect each other in various ways. Error also occurred during data analysis stage, for example in the coding and tabulation process.

There are three methods normally used to detect the error, i.e: record checks, consistency checks and re-interviewing. Since this survey is the first of its kind for the MR passenger service, re-interviewing may be the best method, but the problems in terms of time and cost limitation prevent us from doing so. This is another reason for suggesting that four surveys at least needed to be carried out at the stage of fare experimentation. The first of these was carried out in January 1990, as a pilot survey using the stated preference method, and 100 passengers were taken as the sample. The findings from the SP survey are discussed in some detail in Chapter Six.

The response rate for 1987 survey varied between 80 per cent and 90 per cent or even 100 per cent. SPSS package was used to analyses and tabulate this data. Statistical descriptions like mean and standard deviation were applied at this juncture. Cross tabulation between pairs of variables was used to search for associations between them.

In estimating fare elasticity findings from the survey are used to support other types of data provided by MR. It is worth noting that this is a starting point for MR to conduct



more studies of the same level in order to ascertain public opinion on the past and present service. Internal sources alone would prove insufficient, since these do not reveal journey purpose.

Personal characteristics of the travellers such as ethnic group, income, age, employment, car ownership and so on can only be obtained from a survey. This study has surveys which were based on actual travelling activity. In the initial experimental stage, another two surveys were carried out applying actual activity (revealed preference) and planned activity (stated preference) methods. The detail on these two surveys can be found in Chapter Six.

Findings from all accredited sources will be the guideline for elasticity estimates, which then can be used for fixing the fare, for fare discrimination, and for simulation of the demand and revenue forecast (for the short-term period, example 2-3 years). **MR is recommended to carry out its own experiment in fare changes, so to learn more about the different elasticities of its services using both revealed and stated preference methods.**

### **3.5 Estimate of Bias, Reliability and Suggested Means of Verification**

In this particular study, bias cannot be avoided. It occurs both in the survey, interviews in Malaysia, interviews with other researchers here, and bias from researchers' personal judgment. Bias is also involved since we are unable to get adequate data elasticity estimates. Another very obvious bias is the researcher's own judgment on elasticity estimation. It is influenced by readings, interviews, documented data, surveys and her own observations. Assumptions were also made, based on the past and current situation of the country.



There is no study in fare elasticity in a developing country which we can use as a guideline in our work as a starting point except one in Zimbabwe in 1985. The very important point that we shall highlight here is why we choose -0.6 as our starting point of fare elasticity for MR. This was suggested by Mr P White from his work and research experience (in Malaysia, Zimbabwe and a few other developing countries) on transportation systems in general (not on railway fare elasticity as a single study).

All the factors mentioned earlier always influence public or travellers' decisions and these eventually affect the elasticities estimation.

MR is a small railway system (and the network covered by this study is about two-thirds of the whole system). Therefore, as much as possible relevant data and information was gathered in order to obtain an "actual" elasticity estimation and demand forecast.

We conducted two field surveys only, and not a total usage survey, because of cost limitation. MR gave permission to do the survey on-board and at the station; they also provided free travel for the enumerators for four days on all types of service. Other expenses were sponsored by the researcher's employer. [According to WHITE (1986)] - *"A small random sample taken over the network as a whole is sufficient to give various variable estimates of total trips, passenger Km, distribution of trips by time of day, ticket type, etc..."*.

Other reasons for choosing the sampling method were to save labour required both for fieldwork and for processing the data, and also to save time. A sample often permits a higher overall level of accuracy than a full enumeration. More checks and tests for accuracy can be afforded at all stages; and more care can be given to the editing and



analysing process. As described by KINNEAR (1979) - *"The smaller the study, the more likely we are to obtain more skilled people for each stage of the research process. As the staff gets bigger, the quality of people will fall, and the control and supervision of their activities will become more difficult"*.

The survey sample was chosen randomly. By this sampling method, each individual has an equal probability of being chosen for the sample. BAILEY (1982) viewed that, *"Random sampling has the advantage of cancelling out biases and providing a statistical means for estimating sampling errors"*.

There were 420 passengers in our sample. Ten enumerators were employed for four day survey on trains and at stations, five for Kuala Lumpur to the north and another five for Kuala Lumpur to the south. The average interviews per day was 100, eg., 10 respondents per enumerator. This gave a total of 400. The other 20 interviews were divided between the researcher (northbound) and one colleague of hers (southbound), both of whom at the same time supervised the enumerators. The samples were considered representative because they were from all types of train service. Interviews were undertaken at a station with any travellers without pre-checking what classes they were going to travel on. The split between train and station was 80:20, meaning 80% were interviewed on board a train and another 20% at the station.

Although the planned stratified random sampling was changed to the systematic sampling, the sampling error still occurred because the fluctuation in demand is very obvious in the case of the long distance train service, where the reason for most travel is visiting. (Note: The end of each month is busier than other times because salaries are paid monthly in Malaysia, and this also is thought to affect travel patterns in addition to the aforementioned seasonal factors).



### **3.6 Analysis**

#### **3.6.1 Economic Analysis**

Micro-economic analysis inevitably has a major role in this study, particularly the concept of demand applied to transportation. It includes:

- (i) Identification of factors which affect demand. The emphasis is on which factors have stronger influence and which less.
- (ii) Concept of fare elasticity of demand. In this area, the study will highlight the concept in general, type of elasticity in transportation, methods of elasticity measurement and application of this concept in MR. It also includes the reasons why this concept is chosen and how to apply it in MR operations in order to improve their financial performance.

There are no published studies available on how those factors (except fares) which influence demand are used to adjust estimates of fare elasticity. It was explained earlier that even though the estimation is for fare elasticity, other factors bear importantly upon variation in the elasticity of one group of travellers compared to another. For example, for those who have £1,000 disposable income, £20 fare has not the same value as those who have only £400 disposable income. A further illustration is the case of those who are living near to their old folks, (their travelling is for visiting purposes), the fare forms a negligible proportion of disposable income but those working in Kuala Lumpur whose close relatives or parents are in the north of the Peninsula, they have to regularly put aside a certain budget to meet the heavy travelling expenses of a visit.

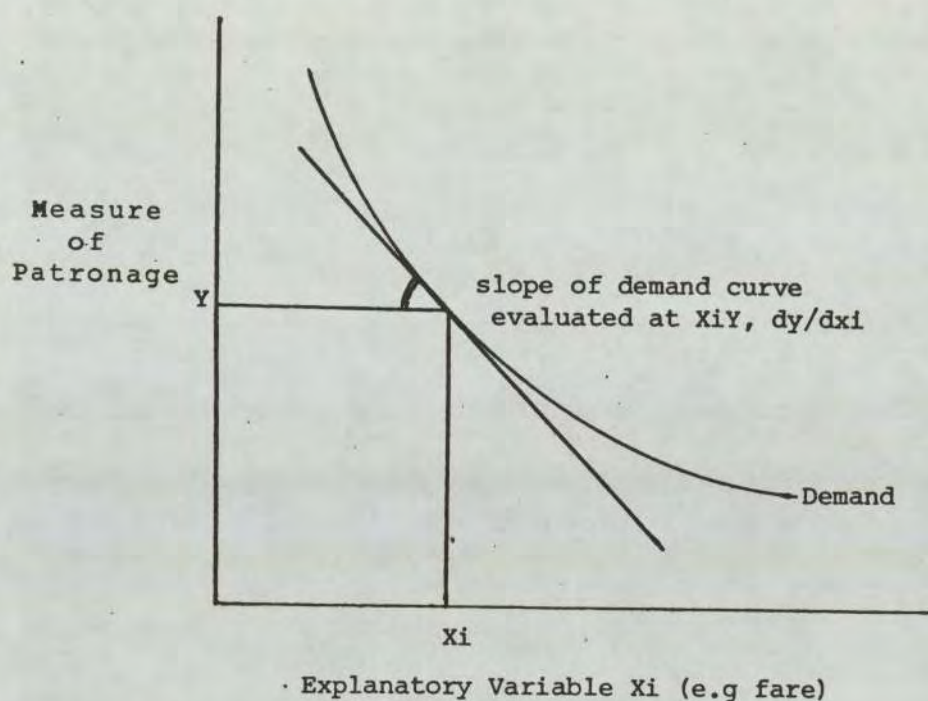
The demand concept is applied in this study because through this concept we will see what type of market MR is in - perfect competition, imperfect competition or monopoly. Fare setting will be different between an organisation which is in perfect competition and in the monopoly situation: MR happened to be in an imperfectly competitive market. Any



move towards fare re-structuring or similar policies will arouse retaliation from its competitors.

Before the elasticity concept could be introduced in this study, it seemed essential to understand the demand concept because the demand curve is the relationship between price, (in this case fare), and the quantity demanded by the market.

**FIGURE 3.2**  
**DEMAND CURVE**



The elasticity on the tangent of demand curve at  $(X_i, Y)$ , is  $dy/dx_i$ .

Although the literature showed that there are numerous fare elasticity measurements available, namely, point elasticity, mid-point elasticity, arc elasticity, shrinkage ratio, linear elasticity, etc. in practice only mid-point and arc elasticity are widely used. The reasons for not using any other elasticity will be explained in the later chapter.

Data from each service yields two ranges of elasticity value, one reached by RP methods, the other by SP methods. These ranges may vary at successive stages of the experiment. One therefore needs, for fare-setting purposes, to derive a control range of average elasticity values for each of the two methods. At the end of the experiment, one can compare both these control ranges to the actual out-turn. At the next stage, when fares may be revised again, one can then choose the method where the central range conforms most to the out-turn (rather than the method which diverges most). In this way one's method can converge with reality.

The market structure in MR is different from other parts of the world, especially those well established railways in advanced countries. In Malaysia, railways serve (or are meant to serve) those with low income for long distance travel: for short distance, travellers prefer to take the bus or taxi. This is the main reason why we cannot simply take the elasticity estimation of other countries directly; Malaysia has a different background of economic and social habits, culture etc. Evidently the only way to apply elasticity concept is by conducting fare experiments and gathering public opinion through a survey. The estimates from other countries are only used as a guideline to start the experiment because MR has never had even a single estimation on elasticity of demand. The elasticity resulting from this proposed experiment might fall into the same range as in other railways. If it appears to be outside the range, this would herald a new discovery - an elasticity for a developing country's railway system. What we are going to suggest in the proposal is an experiment for the very short term (say one year), to attempt to increase revenues by fare adjustments and at the same time to get better estimates of elasticity for future fare adjustment.



### 3.6.2 Experiment proposal

The experimentation proposal aims to show MR how to carry out the actual field experiment and also to provide enough information for MR to judge the potential benefits and risks. Careful selection of routes, services, and timing is clearly involved, and it is suggested that the critical criterion of 'typicality' would result in a representative cross-section of services including express, ordinary day and night long-distance, and commuting trains, covering both peak and off-peak periods in seat occupancy.

The method is experimentation within the context of action learning, and it follows experimentation within the context of action research: when faced by a complex situation and incomplete evidence, one way to progress is to 'do something' and observe the result.

The aims of action learning are in solving problems combined with personal/organisational development; learning how to learn is the real prize. In his view, Lawlor – (PEDLER (ed) 1983).

*"I think 'learning how to learn' is a trial and error approach to problem solving with the important requirement to learn from our experiments. Indeed the idea of deciding in advance how we intend tackling a problem, trying it out in the real world and then learning from the results has always been the basis of human progress".*

After sometimes this study was carried out, it was discovered that there exist the complexity situation both in term of research and MR management. Therefore the most sensible policy at the moment is to proceed this research by suggesting to MR to apply an action learning approach in the whole experiment.

Hopefully MR can carry the groundwork of this study forward into a full-scale series of closely monitored experiments.

REVANS (1982), the father of 'action learning' has divided the process into five major steps:

1. Observations on the external world;
2. The formulation of theories based on these observations;
3. The design and conduct of experiments to test these theories;
4. Comparison of the experimental results with the results predicted by these theories;  
and
5. The rejection, modification or confirmation of these theories in accordance with the results of these comparisons.

These five major steps embody the main features of the scientific method. Action learning is an elaboration of the five-step scientific method into the field of practical action. It aims to ground management decision making on rational principles and to structure rational behaviour in specific contents.

The five steps outlined above can be formulated in terms of management strategy:

- an assessment or survey of the existing problem situation;
- the formulation of policy proposal;
- use of experimental techniques to test various alternative policy proposal,



- comparison of proposal on the basis of experimentation,
- implementation and monitoring of policy.

This action learning acknowledges a close parallel between the use of scientific method and a rational approach to solving administrative problems. It is on the basis of this philosophical approach that the present study is recommending that MR undertakes experiments in fare changes. MR management, in order to optimise its revenue, needs to be able to learn through the practical experience in potential impacts of various fare changes.

### **3.7 Conclusion**

MR is a government agency which is earning money but receives some amount of subsidisation from government to cover some of their operating loss. Whereas they once enjoyed monopoly status, they now have to compete with other types of transport – road, air and maritime (this is just for freight). A major constraint persists in that they do not have enough freedom in policy making. The interview with MR personnel implied their strong support for privatisation. If they are given enough decision power they will make it their priority to improve MR operations, in other words to increase net revenue.

The statistical data from MR, even though they are out of date, are still valuable in showing the trend of demand fluctuation and segmenting the market according to type and class of service. This is supported by findings from the survey in 1987 where the passengers showed how variable was their travelling activity and their preference. These depend on their income, travelling purpose, and the availability, comfort and fare of other modes of transport.



Careful design in the survey questionnaire – taking into account all aspects of sampling, choosing and training of enumerators – will reduce bias, which normally occurs in many stages of the survey and its analysis. This will allow us to obtain more useful and meaningful information towards better elasticities estimates.

Economic analysis is the main approach to the methodology. In this sense, the concentration is on microeconomic analysis, particularly, how fare affects demand and how to estimate the elasticity according to the segment of the market. Differences in economic and social background will oblige MR to obtain its own elasticity estimates. However, we still have to use other railways' elasticities and suggested estimates from some transport research experts.

The best way to carry out the experiment (or in fact for the whole study) is by an action learning process. RP and SP methods were viewed to be the optimal solution for conducting experiment. The recent practice in a number of established railways around the world suggested that, while these two approaches are useful in their market researches and action plans, they still apply them as two separate methods. The RP and SP methods could be combined and modified. One also needs a feasibility study to show MR the practical possibility of carrying out a full-scale experiment with particular emphasis on costs, manpower and local culture.

Hopefully, the findings from the proposed fare experiment constitute another contribution. Until this becomes available, there appears to exist only one other source for reference. It is also hoped that this will make MR and the Ministry of Transport realise that the former need more power to make decisions if they want to compete profitably in the open market. MR are also facing the problem of inexperienced management; they are attached to MR only as administrators and have very little motivation to become good



managers. This underlying weakness detracts from the efficient working of market mechanisms, since the ability to compete is only insufficiently developed, if at all.

Findings from the literature search, surveys, interviews, published and unpublished data and information will be used to estimate elasticity values for different kinds of passenger. This will be followed by the simulation process, then the demand forecasting stage and finally new fare setting, (as discussed in detail in the coming chapters).

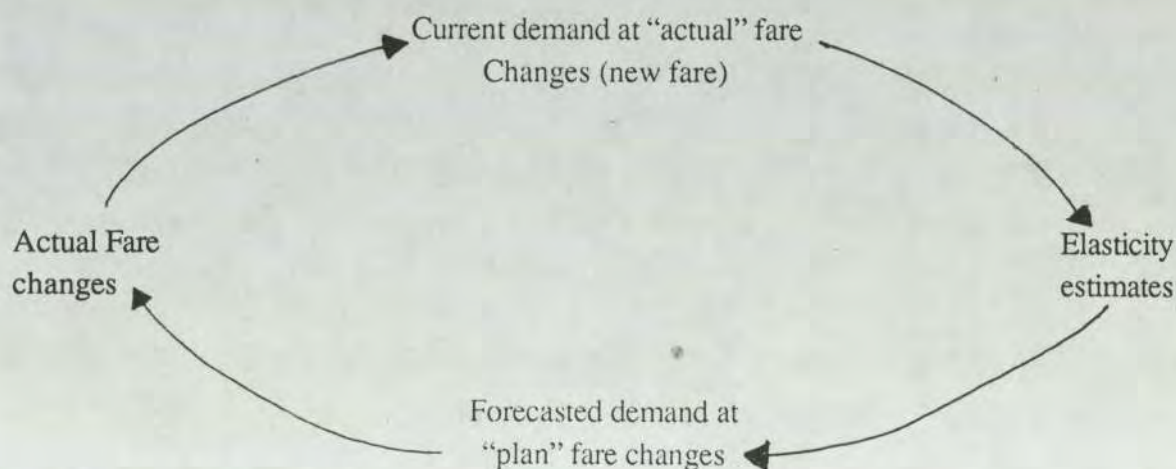
## CHAPTER FOUR

### DATA ANALYSIS

#### 4.1 Introduction

The previous chapter has underlined the sources of data and information we use in this study, and now this chapter will try to analyse those data in detail. Besides the analysis of actual data, we also will deal with the theoretical part of certain factors such as costs, contribution and revenues. The last part of this chapter analyses the elasticity estimates from the literature which become the guideline to start MR own's ranges. The findings of this chapter are going to be applied in Chapters Five and Six – dealing with the experimental proposal. So this chapter will also introduce some elasticity estimates which can be used to help determine fares and how to adjust fares whenever necessary.

It is arguable that fare elasticity of demand will help management to forecast the effect of fare changes. In order to work out fare elasticity estimates we need to know the demand for the railway service. Then the elasticity estimates will help to forecast demand. But before this forecast stage is reached, one has to ascertain the basic fare in order to discover by how much fares are supposed to increase or decrease. This process will continue as a cycle:





While in the process of rate making or fare determining, one could not sensibly ignore factors like costs to the operator, characteristics of consumers and their preferences and the potential market. Other elements involved in this process include the previous experiences of the operator in terms of demand, revenue and the normal average rate of occupancy, (ie. number of seats taken divided by number of seats offered). Setting up the fare, means not just setting the basic fare but also segmenting it according to the market. This will lead to estimating different elasticities for different segments of the market.

## **4.2 Costs**

### **4.2.1 Definition**

The cost of transport can have two meanings, it can refer to the cost of a service from the standpoint of the supplier, or of the user. In this former sense, it will relate to the economic resources required to produce the service; and in the latter sense, it will relate to the monetary payment by the user of a service, and also the quality provided for this monetary payment. In this chapter, we are interested in the supplier's point of view.

Cost is an important issue because if an operation is not costed, either before or after it is carried out, there is no way of knowing:

- (i) What price to charge
- (ii) Whether the revenue received is sufficient. The question raised here is what *is sufficient* in terms of revenue? It means the money received must cover all the costs of carrying out the operation and furthermore provide an additional amount as profit.

#### 4.2.2 Cost Structure

In general, the term 'cost structure' for transport indicates the manner in which the total cost of a mode of transport is divided up between fixed, variable and joint costs.

- Fixed costs - are those costs that do not vary significantly in the short-run as a result of any particular decision.
- Variable costs - sometimes called incremental, marginal, out-of-pocket or avoidable costs, are those costs which change in total as output alters –although, of course, variable costs per unit of output (ie.extra seat) will often remain constant as output changes. In other words, if a particular traffic should not be handled, that cost could be avoided.
- Joint costs - are those costs of activities which cannot physically be separated in terms of fixed and variable, so that if incurred for one purpose they automatically become available also for another.

In MR the costs classification is slightly different, where they are known as fixed, variable, contribution and ownership.

Since the fixed costs and variable costs have the same definition in MR as above, one needs only describe the other two categories, as follows:-

- Contribution - Is the difference between revenue and variable costs. In order for the railway to break-even, this contribution must be sufficient to cover the fixed costs. Profitability begins when the total contribution from all traffic exceeds the railway's fixed costs.



Ownership costs - These are costs incurred for the capital assets, which are consumed gradually over a lengthy period. The cost of such resources, therefore is spread over the period of its expected useful life, by a system known as depreciation. Therefore the ownership cost is the total of depreciation, the portion of the resources cost attributable to the period, and the costs of capital.

The costs in any railway undertaking are broadly divisible into a number of distinct classes. The following refer to MR costs.

- (i) **Train Service** - the provision of the train including train crews, fuel and power, provision of rolling-stocks, maintenance, depreciation, cleaning and shunting, workshop and depot maintenance.
- (ii) **Terminals** - the provision of joining and alighting points, staff, buildings, plant and equipment, collection and delivery service.
- (iii) **Track & Signalling** - the provision of the way or route, renewal and amortisation of the rolling stock and equipment.
- (iv) **Administration** - the management of MR.
- (v) **Interest** - servicing of the capital commitment

(vi) Replacement provision - The provision of funds equal to the difference between gross Replacement costs\* and the gross book value\*\*

NOTE: Definition by THOMPSON (1974)

#### 4.2.3 Rate - making in MR

In pricing policy it is important to relate prices with costs. As discussed earlier, when revenue exceeds variable costs, the operator will get his contribution. Further when the total contribution figure is above the fixed costs, it means profit is obtained from the operation. A very simple "rule" to set fare for the distance – base travelled is:

$$\text{Fare per km} = \frac{\text{Total Cost}}{\text{Total Passenger - km}}$$

$$\text{OR} \quad \frac{\text{Cost per vehicle - km}}{\text{Average per pass-load}}$$

This formula is from WHITE (1986).

Under the first version, a common fare per-km would set over the whole system; this is current MR practice. While under the second version fares would vary with costs and loadings; for example, a poorly loaded early morning service would bear a high fare, a well loaded inter-peak service, a low one. The reverse of the latter version is going to be recommended for MR experimentation with fares, which means charging a higher fare during

---

\* Gross replacement costs = cost of asset replacement with equipment of a like nature at present day prices.

\*\* Gross book value = The original cost of an asset when acquired by the undertaking.



the peak time (holidays, Hari Raya and Chinese New Year) and a lower fare in the off-peak seasons. This vital explanation follows in Chapter Five.

The problem with the MR costing system is, that it is not classified according to *class* of service, ie., first, second and third class. Cost classification according to *type* of service - express, mail or ordinary train also does not exist. Whereas, the fare charged does differ between classes and between types of service.

By taking the total costs and the total passenger - km for 1986 as an example, MR average fare should be:

$$\text{The fare per km} = \frac{\text{Total costs}}{\text{Total passengers - km}}$$

where, the costs for the passenger sector is 55% of total cost:

$$\begin{aligned} \text{Therefore the fare} &= \frac{211,108,463 \times 55\%}{1,368,531,245} \\ &= 8\frac{1}{2} \text{ ¢ per km} \end{aligned}$$

The current fares per Km, which were fixed as long ago as 1984, are (for ordinary services) as follows:

|           |            |
|-----------|------------|
| 1st Class | 12.14 ¢/Km |
| 2nd Class | 5.47 ¢/Km  |
| 3rd Class | 3.36 ¢/Km  |

There was no reference to explain how MR fixed these fares; nor how express service fares between main urban stations are devised, since in the latter case they depend not on fare per kilometer but upon the station at which the train is boarded. Calculations according to class of service cannot be undertaken, because MR does not distinguish costs according to class, therefore particular fare levels cannot be determined in this way. Nevertheless, calculations on the basis of total costs in 1986, as undertaken by the research, yield a cost-covering average fare of 8.5 ¢/Km. From this estimate, it appears that both 2nd and 3rd class fares are set below this level, with only 1st class fares set above.

Normal commercial practice would be to use a "cost-plus-profit" or "mark-up" method of pricing, so that each customer would pay a rate covering specific cost to the operator plus some 'contribution' towards overheads. (In this case specific cost refers to variable cost).

The ratio of fixed costs to total cost is a valuable measure to indicate the 'mark-up' over long run variable cost that a railway should charge if full long-term financial viability is to be achieved. Based on their 1978 analysis, MR decided that the average contribution needed by MR to break even was a 73% mark-up over the long run variable costs. When the revenue exceeds the variable cost the firm is able to contribute to covering its fixed costs.

The normal ways to cover variable costs and furthermore to meet fixed costs are:

- (i) Increase fare, so leaving more contribution after variable cost, BUT we should be aware of the highest limit to which it can be increased because there are dangers of stretching it too far: ie. losing total revenue through falling demand. This is where the elasticity concept should play its role in order to guide by how much the fare can be moved.



- (ii) Improve efficiency to reduce variable cost. It means less revenue has to be used to cover variable cost, thus more is left as contribution towards meeting fixed costs. This depends on the tactical strategy of MR management and the attitude of other employees.
- (iii) Another way is by increasing traffic. This can be achieved by providing a better service to customers at a competitive (but profitable) fare. Effective marketing of the services can also help to increase traffic.

According to MR requirements, a good rate-maker or fare-setter must have good knowledge of costs because by knowing them he can set his rate floor. At what point above this floor the fare is set will depend upon his ability and experience in the market demand of transportation. Normally experience is gained over a long period of time. A problem occurs here because MR has not changed its fares very often, so there can be little experience. Anyhow, this is not an excuse for MR not to try to gain more revenue through fare structure: it is where experiments with fares could play a major role. For in addition to forecasting market demand using the elasticity concept, the framework of the experiment itself suggests ways and means of actual fare adjustment: in other words the experiment is analogous to an action learning process. MR rate-makers, together with the rest of the team carrying out the proposed fare experiment, will thereby start to do "something", and hence learn from it and acquire the experience. Series of experiments on fares and knowledge from studies of other railways such as those on fare elasticity of demand, might help a fare-maker to learn his way faster. Opinions from the travellers or potential travellers also will be a great help in setting the fare. This opinion can only be obtained from survey(s) of the public.

#### **4.3. Survey Analysis**

This survey formed part of the data and information sources. Since this chapter deals with data analysis, it is necessary to show in detail and to quantify the response of the survey



sample. The survey was mainly designed to provide information to assist in making elasticity estimates. It also can be used to find the way to attract the potential customers by taking their opinions and travel plans into consideration when MR begins restructuring its fares as well as when MR improves its quality of service. Roughly, the survey has tried to sort out the following factors of the train travellers:

- (i) Socio-economic background.
- (ii) Travelling activities.
- (iii) Opinion on fare and quality of service of train.
- (iv) Opinion on fare and quality of service of train compared to other modes.
- (v) Traveller's expectations and hopes about future train fares and services.

The initial survey had a number of purposes. These were to provide some basis for MR elasticity estimates, but also to try to establish the general characteristics of the service and its passengers. At that stage the researcher was not adequately familiar with RP and SP methods and while the survey has elements of both approaches it was decided to conduct two further surveys with questionnaire orientated towards SP analysis. The results of these surveys are covered in Part Two of Chapter Six as they provide useful guidance in how MR should conduct the full scale experiment. Analysis of three surveys did not provide any strong evidence for changing the earlier estimates of elasticity.



#### 4.3.1 Analysis by questions

There were eleven questions given on the socio-economic characteristics of the respondents, (see Appendix E).

The percentage of respondents staying in the same State as their parents or close relatives is 55.7%. This means that the balance of 44.3% has to travel for longer distances to visit their hometown.

Some 87.1%\* respondents belonged to young and middle-aged categories of travellers (average ages 15 years and 40 years). This is paralleled by students and workers: they also comprise 87.1%\*\* of the total respondents. The Malay ethnic group as such comprises the highest percentage of train travellers, 72.8%. Traditionally the Malay have closed-knit relationships with their folks. In general, the Chinese are richer than other ethnic groups, so they have better opportunity to own a car or to travel by the more convenient and fastest transport, that is aeroplane.

As expected, those without private transport form the highest percentage group travelling by train, (38.6%) followed by car owners (30.0%) and motorcycle owners (20.5%). This yields a total of 89.1%. Another 3.2% own other types of transport and about 7.7% respondents did not give any answer for this question.

Men were the majority travellers, forming 65% of the total sample and 35% were women travellers. There were no children interviewed because it was decided that the sample would consist of adults only. Single persons comprised more than half of the respondents (52%) and another 46% were married; 2% were divorced or widowed travellers. This marital status category is important in travelling patterns because single persons travel more in order to see

their parents or relatives and they are more flexible in terms of time and commitment compared to those already having their own family.

In terms of occupation\*\*, the majority of the respondents are in the working group (66.8%) followed by students (20.3%), another 11.2% are housewives, retired or unemployed: a balance of 1.7% gave no response to this question.

About 33.2% work as clerical staff either in the government or private sector, while another 36.1% are included in other categories such as labour, officer, salesmen or running their own business. The balance (30.7%) refused to reveal their jobs (with few exceptions ie. housewives).



The respondents' monthly income (gross) spread almost evenly in a wide range as follows:

| Monthly Income (Gross) | %      |
|------------------------|--------|
| Less than \$200        | 2.2    |
| \$201 - \$500          | 20.3   |
| \$501 - \$750          | 18.1   |
| \$751 - \$1000         | 11.1   |
| More than \$1001       | 21.0   |
| No answer              | 27.3   |
| Total                  | 100.0% |

Their age group\* are as follows:

| * Age group     | %      |
|-----------------|--------|
| 16 - 20 yrs old | 14.5   |
| 21 - 30         | 51.5   |
| 31 - 40         | 21.0   |
| 41 - 50         | 4.0    |
| 51 - 60         | 4.0    |
| 61 - 70         | 3.5    |
| More than 70    | 1.5    |
| TOTAL           | 100.0% |

The majority of respondents travel for non-business or working reasons: the highest percentage go for visiting friends or family. This question also allowed respondents to confirm more than one choice. The result is:-

| <b>Journey purpose</b>                                                   | <b>%</b>                                                            |
|--------------------------------------------------------------------------|---------------------------------------------------------------------|
| <b>Regularly</b>                                                         |                                                                     |
| Working                                                                  | 9.9}                                                                |
| Business                                                                 | 10.8} 20.7%                                                         |
| <b>Occasionally</b>                                                      | <b>%</b>                                                            |
| To college                                                               | 7.0 - normally 3 times a year<br>(travel back home to visit family) |
| Visit Friend                                                             | 19.4                                                                |
| Visit Family                                                             | 27.4                                                                |
| Exhibition/festival                                                      | 1.2                                                                 |
| Holiday                                                                  | 10.8                                                                |
| Others                                                                   | 7.8                                                                 |
| No answers                                                               | 5.7                                                                 |
| <b>TOTAL</b>                                                             | <b>79.3%</b>                                                        |
| Therefore: total for regular journey<br>and total for occasional journey | 20.7%<br>73.6%                                                      |
| No answer                                                                | 5.7%                                                                |
| <b>TOTAL</b>                                                             | <b>100.0%</b>                                                       |

Visiting friends and relatives account for 53.8% or about half the responses. If this purpose is combined with other leisure purposes, the percentage comes up to 73.6%. Travelling to and from college also occurred occasionally, probably 3 times a year. Every term-break holiday, the students will go back to visit their families. This will leave only about 21% who travel by train for work and business, in which case their highest priority is to move fast.



train for work and business, in which case their highest priority is to move fast. This nearly coincides with the 24% of all travellers who journey as (or more) frequently than once a month as follows:

| <b>Trip Frequency</b> | <b>%</b>      |
|-----------------------|---------------|
| Every working day     | 3.5%          |
| Once a week           | 7.4           |
| Once a month          | 13.1          |
| Occasionally          | 73.8          |
| No answer             | 2.2           |
| <b>TOTAL</b>          | <b>100.0%</b> |

Another 73.8% travel occasionally; more than half of these occasional travellers normally make their trip about 1 to 4 times a year.

| <b>Trip frequency</b>   | <b>%</b>      |
|-------------------------|---------------|
| Once a year             | 10.9          |
| Twice a year            | 16.3          |
| Three times a year      | 16.8          |
| Four times a year       | 10.6          |
| Five times a yaer       | 6.4           |
| Six to ten times a year | 9.1           |
| More than 10            | 6.4           |
| No answer               | 23.5          |
| <b>TOTAL</b>            | <b>100.0%</b> |

The most popular type of ticket sold is one way ordinary (no concession) – about 67.6%, another 11.4% of the respondents purchased return - ordinary, and 9.9% only enjoyed the concessionary ticket.

In terms of class of service, 62.9% of the respondents choose to travel second class, 31.2% third class and 5.9% only go first class. This is due to the fare; first class train costs as much as travelling by air. So if one can afford to go first class, one might as well choose aeroplane because the travelling time is very much shorter. In addition, in Malaysia travelling by plane gives some sort of 'higher class' feeling for the status conscious travellers. Most of the respondents in the first class train are army and police officers, government officers and MR officers on-duty whose tickets are paid by their employers.

The respondents were given seven choices of modes of transport they used most.

| Type of modes | %             |
|---------------|---------------|
| Bus           | 30.8          |
| Car           | 24.0          |
| Train         | 22.7          |
| Motor cycle   | 12.8          |
| Others        | 9.7           |
| <b>TOTAL</b>  | <b>100.0%</b> |

Nearly 78% of the respondents travel more often by other modes than train, especially bus and private car because bus is more flexible, more frequent and cheaper; while taxi is faster and offers door-to-door service.

It seems that in order to complete their journey, a high percentage of travellers have to use other modes before and after the train.



| Transport before Train |        | Transport after Train |        |
|------------------------|--------|-----------------------|--------|
|                        | %      |                       | %      |
| Bus                    | 31.4   | Taxi                  | 35.9   |
| Taxi                   | 29.7   | Bus                   | 32.9   |
| Car                    | 25.8   | Car                   | 21.4   |
| Others                 | 13.1   | Others                | 9.8    |
| TOTAL                  | 100.0% | TOTAL                 | 100.0% |

Nearly three-quarters of the respondents travelled for long distances between 200km and 400km.

| Distance         | %      |
|------------------|--------|
| Less than 200 km | 17.6   |
| 201 - 300 km     | 20.0   |
| 301 - 400 km     | 54.2   |
| More than 400 km | 8.2    |
| TOTAL            | 100.0% |

The figures confirmed that the express service, night mail and night sleeper train are the most popular services because these services cater for long distances and limited stops only. The survey showed the following figures of respondents who chose those services:-

| Services        | %      |
|-----------------|--------|
| Local train     | 10.4   |
| Night sleeper   | 11.9   |
| Day mail        | 12.9   |
| Night mail      | 15.3   |
| Rakyat Express  | 16.1   |
| Sinaran Express | 32.4   |
| No answer       | 1.0    |
| TOTAL           | 100.0% |

Shorter distance travellers, (i.e. less than 200km) prefer to travel by local train and day mail train. Local trains stop at every station and day mail trains have more stops than night mail.

There are eight classes of service offered by MR. It seems that third class and second-class without sleeping accommodation are the popular types taken by travellers. The following analysis shows the clear picture:

| <b>Class of Train</b>                   | <b>%</b>      |
|-----------------------------------------|---------------|
| Third class                             | 31.2          |
| Second class non-airconditioned         | 10.8          |
| Second class air-conditioned            | 19.9          |
| Second class sleeping berth - lower bed | 28.5          |
| Second class sleeping berth - upper bed | 3.7           |
| First class ordinary                    | 1.5           |
| First class cabin, non-airconditioned   | 1.7           |
| First class cabin, air conditioned      | 2.7           |
| <b>TOTAL</b>                            | <b>100.0%</b> |



Respondents were given thirteen reasons for taking train from which to chose. They were allowed to answer more than one reason:

| Reason for taking train      | %             |
|------------------------------|---------------|
| Comfort                      | 17.4          |
| Safety                       | 15.4          |
| Reasonable fare              | 14.5          |
| Enjoying the scenery         | 11.5          |
| Other reasons (nine choices) | 41.2          |
| <b>TOTAL</b>                 | <b>100.0%</b> |

The majority of respondents (about 81.7%) thought that the present fare was reasonable when they were asked to answer whether it was reasonable or not; about 74% or nearly three-quarters of the respondents were willing to pay 10% more, provided that the service level improved.

The overall opinion of the service – in term of ticketing system, waiting place at the station, cleanliness on train, seating on train, staff courtesy on the train and at station, food quality in the train buffet and toilet facility on train – was “good, BUT still needing improvement”.

The last section of the questionnaire, which contains eleven questions, required the respondents to rank their answers by comparing fare and quality of service of train with bus, taxi, shared car, own car and aeroplane. The scaling method here is Semantic Scaling - BAILEY KD (1982). They were given numbers 1 -5 for the ranking, where number 5 meant best, cheapest, fastest, safest, largest, easiest (the good quality), and moved down to number 1 for worst, most expensive, slowest, most unsafe, smallest, hardest (the worst quality). TABLE 4.1 shows the ranking in this last section of the questionnaire where the highest scoring rank is shown for each aspect together with the percentage of respondents “voting” for that rank.

**TABLE 4.1**  
**MR SURVEY - OPINION ON FARE AND QUALITY OF SERVICE - TRAIN**  
**COMPARED TO OTHER MODES - SEPTEMBER 1987**

| FARE/SERVICE<br>(a)                       | RANKING<br>NUMBERS<br>(b) | DESCRIPTION<br>(c)        | % SCORE<br>(compared to other<br>modes)*<br>(d) |
|-------------------------------------------|---------------------------|---------------------------|-------------------------------------------------|
| Fare                                      | 4                         | Cheap                     | 28.2                                            |
| Speed                                     | 3                         | Moderate                  | 30.9                                            |
| Waiting time                              | 4                         | Short                     | 30.9                                            |
| Service frequency                         | 3                         | Moderate                  | 30.9                                            |
| Comfort                                   | 4                         | Good                      | 35.6                                            |
| Ticketing System                          | 4                         | Easy                      | 35.6                                            |
| Opportunity to work<br>during the journey | 5                         | Largest amount<br>of work | 40.1                                            |
| Staff Courtesy                            | 4                         | Good                      | 39.6                                            |
| Enjoying the Scenery                      | 5                         | Best                      | 36.4                                            |
| Safety                                    | 5                         | Safest                    | 43.1                                            |
| Overall opinion                           | 4                         | Good                      | 37.9                                            |

\*Among the 5 scaling numbers the highest score over 28% of respondents declared that they saw train fares as 'cheap' compared with other forms of transport ('cheap' was 4 on a Semantic scale 1-5); the remainder, nearly 72%, accredited the fares of other forms of transport (5 types) as 'cheap'. The 'best ranking' for this question was scored by bus, ie, scale number 5 as 'cheapest'.



**TABLE 4.2**  
**MR SURVEY – SUMMARY OF OVERALL OPINION ON TRAIN SERVICE**

| <b>RANKING NUMBER</b> | <b>ITEMS</b>                                                                       |
|-----------------------|------------------------------------------------------------------------------------|
| 3                     | Speed, service frequency.                                                          |
| 4                     | Fare, waiting time, comfort, ticketing system, staff courtesy and overall opinion. |
| 5                     | Opportunity to work during journey, enjoying the scenery and safety.               |

It seems that MR needs to improve its train speed and service frequency as one of the ways to attract more customers. However, it is worth noting that this is the opinion of train travellers. The findings from the proposed survey in the experimentation phase will probably produce a different picture from this, because the sample will include non-train travellers who intend to go by train but in actual fact might not do so.

#### **4.3.2 Analysis Summary**

Nearly half of the respondents live away from their parents or close relatives. They normally visit their folks' hometown occasionally, on average one to four times a year. Most of the respondents fall in the age range fifteen to forty years i.e. college/university students or workers in the private and government sectors.

The majority ethnic group which travels by train is Malay (they comprise 60% of population but 72% of train travellers). This is one of the important features related to the journey purpose: nearly 50% is for visiting families or friends, due to cultural characteristics, (where



the Malay is originally from a village or small town, but has migrated to the big towns to work). Though now there are changes in this pattern, for the number of Malay living permanently in the cities has risen; yet the habit of having and returning to an original town or '*kampung*' still persists. By contrast Chinese in the big towns are involved in trade and prefer to stay in one big house with all the family – even after the children have grown up and have their own family.

An ordinary, one-way ticket (no concession) is used by two-thirds of the respondents, with the second class service as the most popular among the three classes offered. Probably the main reason for this choice is, that second class has better facilities compared to third class. It is important to note that Sinaran Express and Night Sleeper provide only second and first class travel. These two types of services (Sinaran Express and Night Sleeper) won nearly 50% of the respondents.

First class is not popular because it is expensive; for the same costs, the traveller can travel by plane or special express bus (coach) both of which are much quicker than by train. Normally those who can afford to go by first class train or plane also have their own car or there is a family car available for them, thus shortening overall journey-time from door-to-door.

Those who still travel first class are government pensioners (with concessionary ticket), MR pensioners (special fare) or government officers, and army/police top officers whose fares are paid by their employers. Only a very small number of passengers say that they travel first class 'for fun' or to get an experience.

About three quarters of the respondents travel long distance between 200km to 400km (four to eight hours journey time). More than 50% prefer to travel by bus or car, but train is still a popular choice.



The main features pertinent to travelling by train are comfort, safety and a reasonable fare. In fact more than 80% thought the train fare was reasonable and they were willing to pay more if the facility/quality of service was improved.

From the two categories of opinion about train fare and service, (one, train only; the other comparing train with other transportations, both public and private), it seems that train service fell into the category of good *but needing* improvement.

Findings from the survey would not (or cannot) be used to calculate or to estimate the fare elasticity of demand of MR service directly because the small sample (404) is considered inadequate. However, it can help to segment the services by train, class, day and season, and to give some indications of which services the demand is likely to be elastic, which inelastic. It is also a great help in understanding the background of the train travellers. Another use of this survey is as a guideline to design questionnaires for the proposed surveys in the experimentation section.

The survey shows us in general the kind of MR market that exists: such as occasional peak-time, when it is compulsory for a person (persons) to travel to visit families, relatives or friends during religious celebrations and other public holidays. It also shows the willingness of travellers to pay 'more' as long as there is improvement in service especially in travelling time (speed) and in service frequency. Our survey also indicated that a small segment of the commuting public, consisting mainly of secondary school children and office workers, regularly used local trains around Kuala Lumpur, Butterworth, Johore Bharu, Kluang, Teluk Intan Branch and Kedah Branch\*. The researcher's survey in 1987 can be used as a pilot for the surveys suggested in the experimental proposal (Chapter Six), for it gave some guidelines on conducting fare experiments in terms of choosing a sample, segmenting the market, and

---

\* A survey conducted by a group of students in 1986, when the railbus was at the experimental stage, showed a great demand for commuting services around Kuala Lumpur and Johore Bahru.



timing etc. The findings support the rate of occupancy data in MR, which will be analysed next.

#### **4.4 Rate of occupancy data**

##### **4.4.1 Data Analysis**

Seasonality in demand is one of the main features of railway services especially for long distance travel. It was shown in the earlier part of this Chapter that the main purpose for travelling by train in Malaysia is for visiting one's home town.

The analysis in this section is based on the data provided by MR for 1987. According to the personnel in charge in the commercial department of MR, these figures are considered representative for the last three years, 1984-86.

The data are for number of seats offered and number of seats taken during 1987 for all types of services from Kuala Lumpur to Butterworth and back, and from Singapore to Kuala Lumpur and back. In the case of Rakyat Express the data is for the Butterworth to Kuala Lumpur, further down to Singapore and back to Butterworth service.

Appendices (F-1 and F-2) display the absolute number of the rate of occupancy shown as averages for northbound and southbound services.

The time-periods were classified in nine sections, namely:

- (1) Monday to Thursday
- (2) Friday to Sunday



- (3) First quarter - January, February, March
- (4) Second quarter - April, May, June
- (5) Third quarter - July, August, September
- (6) Fourth quarter - October, November, December
- (7) Hari Raya Puasa
- (8) Chinese New Year
- (9) Other public holidays

There is no distinction made between peak and off-peak during the day because the normal shortest distance for travelling by train on the mainline is about 60Km. Furthermore, demands for the morning express (starts at 7.00am with first stop at 10.00am) and evening express (starts at about 2.30pm) are not much different because both services are operating during office hours. In Malaysia working hours are 8.00am to 4.00pm for the Government office and 9.00am to 5.00pm for the private sector.

Services are classified in five types, as follows:

| Service Type                                      | Class available |
|---------------------------------------------------|-----------------|
| (1) Rakyat Express                                | A, B, G         |
| (2) Sinaran Express<br>(both morning and evening) | B, C, G         |
| (3) Day Mail*                                     | A, B            |
| (4) Night mail*                                   | A, B            |
| (5) Night sleeper                                 | D, E, H, I      |

\* sometimes referred to as ordinary train

## KEY

- A – Third class
- B – Second class non-airconditioned
- C – Second class airconditioned
- D – Second class with sleeping berth (upperbed)
- E – Second class with sleeping berth (lowerbed)
- G – First class air conditioned
- H – First class cabin (non-airconditioned)
- I – First class cabin (air conditioned)



TABLE 4.3a and 4.3b exhibit the average rate of occupancy for a selected service.

**TABLE 4.3A**

**AVERAGE RATE OF OCCUPANCY ACCORDING TO TIME (% RATE OF ALL TYPES OF SERVICE)**

| <b>TIME</b>           | <b>SOUTHBOUND<br/>%</b> | <b>NORTHBOUND<br/>%</b> |
|-----------------------|-------------------------|-------------------------|
| Monday-Thursday       | 55                      | 47                      |
| Friday-Sunday         | 60                      | 54                      |
| First Quarter         | 40                      | 40                      |
| Second quarter        | 52                      | 55                      |
| Third quarter         | 52                      | 63                      |
| Fourth quarter        | 67                      | 73                      |
| Hari Raya Puasa       | 66                      | 71                      |
| Chinese New Year      | 71                      | 75                      |
| Other public holidays | 78                      | 81                      |
| Range                 | 40% to 78%              | 40% to 81%              |

Note: Classification according to time-period shows both bounds have almost the same average rate of occupancy.

In terms of seasonality, both north and southbound showed that the lowest demand is during the first quarter of the year, while the last quarter and public holiday are the popular times for long-distance travelling. During these times the rate of occupancy ranges from about 67% to 78% for the northbound and 71% to 81% for the southbound. The only time when the

northbound demand very much exceeds that of the southbound is on the Mail Day Service for both class A and B.

**TABLE 4.3B**  
**AVERAGE RATE OF OCCUPANCY ACCORDING TO SERVICE TYPE AND CLASS**  
**(% RATE OF EVERY CLASS)**

| SERVICE         | CLASS | NORTHBOUND<br>% | SOUTHBOUND<br>% |
|-----------------|-------|-----------------|-----------------|
| Rakyat Express  | A     | 38              | 53              |
|                 | B     | 49              | 57              |
|                 | G     | 45              | 61              |
| Sinaran Express | B     | 56              | 68              |
|                 | C     | 56              | 72              |
|                 | G     | 44              | 52              |
| Day mail        | A     | 64              | 41              |
|                 | B     | 88              | 41              |
| Night mail      | A     | 65              | 65              |
|                 | B     | 66              | 77              |
| Night sleeper   | D     | 68              | 66              |
|                 | E     | 72              | 79              |
|                 | H     | 67              | 76              |
|                 | I     | 60              | 62              |
| Range           |       | 38% to 88%      | 40% to 81%      |

Note: classification according to class shows that the Southbound has a higher demand than the northbound.

There are several reasons why demand for the southbound is higher than the northbound. Firstly, there are more big towns (in terms of population and industrial development) in the south such as Seremban, Johore Bahru and Singapore (Singapore is a Republic by itself).



Also the interchange station for the main line and east coast branch line is Gemas, again on the southbound route.

Secondly, although Singapore is an island, train passengers avoid the trouble of having to cross the causeway; whereas those who are going to Penang Island, which is opposite Butterworth, have to cross the bridge by road – this bridge opened only about seven years ago, and there is no railway service between the mainland and Penang. Lastly if travellers want to continue journeys to Alor Star or further up to Thailand they have to change on to the local train service in Butterworth or Bukit Mertajam.

The fare charges for both directions, southbound and northbound, are the same. If we try to charge higher to the northern traveller because the cost per km or per seat to the north is higher, MR might lose their share of the market to competitors. Considering that MR has only short networks and only a single track for operation, discriminating the market according to line appears inadvisable. There are two possible strategies that can be imposed for service efficiency as well as for saving costs. They are:

1. (a) Introduce special fare reductions for certain groups of travellers, (in the low-occupancy northbound Rakyat and Sinaran Express services) eg. a group of four travel for the price of three (family members) **or** travel five times during January to March by paying fare for only three times.
- (b) Day mail trains are not as luxurious as express trains, so these could be offered over shorter-distance (around 20-30 kilometers) during off-peak morning and afternoon; (eg: for shopping and leisure trips, perhaps using a travel card).

**OR**



2. Reduce the number of seats by about 30% for those services which have less than 50% rate of occupancy: for example the day mail train on the southbound.

Night sleepers tend to be popular throughout the year for the mainline from Butterworth to Singapore. So the cost savings from reducing express services on the northbound can be spent on the night sleeper service. This can be done by increasing the service quality and offering more seats during the week-end, followed by a fare increase.

These analyses indicate that there are segments in the market – some of them with a high demand (more than 70% seat occupancy) and some at other times with a very small demand. Those times with high demand are considered less elastic, for example during Hari Raya, Chinese New Year, other public holidays and the fourth quarter of the year. While other than these times, demand is more elastic (where an increase in fare might cause a bigger loss in revenue for MR due to reduced demand).

#### **4.5 MR data on passenger numbers**

During the three months of fieldwork (August, September, October 1987), the researcher managed to collect the data on passenger numbers, passenger kms and revenue for 1984, 1985, 1986 and the first half of 1987. It started from 1984 because in that year the present fare was revised, ie. in August 1984. Therefore one analyses the trend in those years for which information is available.

For simplicity, the number of passengers was counted from the origin (from the tickets sold) only. For those services that are available to all three lines, tickets sold in Kuala Lumpur station were divided into three between northbound, southbound and Eastcoast branch lines by 3:4:3 ratio respectively. The ratio for the service which operates only on the mainline is 2:3, ie 2/5 for the northbound and 3/5 for the southbound.



**TABLE 4.4**  
**MR PERCENTAGE OF PASSENGER JOURNEY ACCORDING TO TICKET TYPE IN**  
**THE NB AND SB FOR 1984, 1985, 1986**

| YEAR                | 1984    |         | 1985    |         | 1986    |         |
|---------------------|---------|---------|---------|---------|---------|---------|
| TYPE OF TICKET      | NB<br>% | SB<br>% | NB<br>% | SB<br>% | NB<br>% | SB<br>% |
| Ordinary            | 21.5    | 46.3    | 23.5    | 37.6    | 19.8    | 44.6    |
| Privilege           | 28.7    | 44.7    | 32.3    | 40.4    | —       | —       |
| Rakyat Express      | 45.0    | 55.0    | 36.3    | 63.7    | 37.8    | 62.2    |
| Students (R)        | 46.2    | 40.1    | 51.1    | 43.7    | 46.7    | 42.4    |
| Haji (R)            | 53.6    | 22.0    | 100.0   | —       | —       | —       |
| Group               | 22.9    | 64.9    | 30.5    | 39.0    | 33.6    | 37.0    |
| Forces and Family   | 39.9    | 41.8    | 38.1    | 42.4    | 35.7    | 44.4    |
| Police and Family   | 38.3    | 51.4    | 44.1    | 54.9    | 41.5    | 57.5    |
| Senior citizen      | 26.6    | 54.4    | 26.2    | 52.0    | 24.1    | 48.4    |
| MR pensioner (R)    | 53.0    | —       | —       | —       | 44.7    | 36.5    |
| Govt. pensioner (R) | 24.7    | 75.1    | 38.9    | 61.1    | 54.8    | 41.4    |
| Tourist (R)         | —       | 100.0   | 20.2    | 9.8     | 1.6     | 98.4    |
| MR Express          | 36.5    | 63.5    | —       | —       | —       | —       |
| Pensioner (S)       | 47.3    | 52.7    | 49.1    | 51.9    | 55.0    | 41.7    |
| MR pensioner (S)    | 100.0   | —       | 80.4    | 19.6    | 82.4    | 17.6    |
| Sinaran             | 35.3    | 64.7    | 35.8    | 64.2    | 35.7    | 64.5    |
| RSR ticket*         | 88.1    | —       | 84.2    | 7.4     | 81.9    | 15.5    |
| Other types         | 4.7     | 36.6    | —       | —       | —       | —       |

\* Thailand/Malaysian tourist service

Note: The percentage balance (from 100%) goes to East-Coast line.

Although the summated data covered only the first six months of 1987, they were *generally* for each whole line. (There is no way to allocate them according to the stations where tickets were sold). Normally, the complete data for a year becomes ready in the middle of the following year. It was impossible for the researcher to collect them herself, because at the



outset it was agreed with the MR authority that the researcher had to gather data herself. Only certain data like the number of seats offered and seats taken in 1987 were allowed to be collected by a colleague in Malaysia during 1988.

Between 25 to 30 types of tickets were available from 1984 to the middle of 1987; only four types were being purchased by 5% or above of the number of customers. TABLE 4.5 below exhibits the popular tickets which captured the vast majority of passengers in those periods.

**TABLE 4.5**  
**MR MAINLINE – PERCENTAGE OF PASSENGER JOURNEY AND REVENUE**  
**ACCORDING TO TICKET TYPE FOR 1984 TO HALF OF 1987.**

| TICKET TYPE        | 1984         |                | 1985         |                | 1986         |                | JAN-JUNE 1987 |                |
|--------------------|--------------|----------------|--------------|----------------|--------------|----------------|---------------|----------------|
|                    | <i>Pass.</i> | <i>Pass.</i>   | <i>Rev.</i>  | <i>Pass.</i>   | <i>Pass.</i> | <i>Pass.</i>   | <i>Pass.</i>  |                |
|                    | <i>Nº</i>    | <i>Rev.</i>    | <i>Nº</i>    | <i>Rev.</i>    | <i>Nº</i>    | <i>Rev.</i>    | <i>Nº</i>     | <i>Rev.</i>    |
|                    | <i>(Mil)</i> | <i>M\$ mil</i> | <i>(Mil)</i> | <i>M\$ mil</i> | <i>(Mil)</i> | <i>M\$ mil</i> | <i>(Mil)</i>  | <i>M\$ mil</i> |
| Ordinary           | 67.8         | 47.14          | 61.1         | 36.52          | 64.4         | 39.14          | 65.6          | 47.6           |
| MR Express         | 8.28         | 17.63          | —            | —              | —            | —              | —             | —              |
| Sinaran Express    | 2.2          | 4.21           | 12.22        | 27.99          | 9.65         | 22.16          | 11.4          | 28.9           |
| Rakyat Express     | 7.84         | 14.84          | 6.77         | 12.90          | 9.99         | 18.80          | 6.8           | 12.6           |
| TOTAL (C%)         | 86.12        | 83.82          | 80.09        | 77.41          | 84.04        | 80.10          | 83.80         | 89.10          |
| Total in number A* | 5.06M        | \$46.67M       | 4.64M        | \$45.58M       | 5.33M        | \$46.68M       | 2.67M         | \$27.05M       |
| Grand Total B*     | 5.79         | 58.89          | 5.87         | 55.67          | 6.34         | 58.27          | 3.18          | 30.36          |

\*A + B = C% - (Refer to table 4.5 the last two lines)

The ordinary ticket is available on all lines – the mainline from Butterworth to Singapore, East coast line, Kedah branch line and Teluk Intan branch line. The MR express ticket has been replaced by Sinaran Express since 1985; (the latter was introduced sometime towards the end of 1984). Only those types of ticket were chosen to be analysed in detail because they captured more than three quarters of the railway market as well as contributed about the same



portion in revenue. Although the figures for passengers and revenues for 1987 were given as totals, in accordance with the trend from 1984 to 1986 – 65.6% out of 71.6% were allocated to the mainline. The express services are operated only on the mainline.

The  $3\frac{1}{2}$  years trend shows almost the same pattern in passenger journeys and revenue in each of the three types of ticket (Sinaran and MR express taken as one group). The express services contributed a double percentage of revenue from their percentage of passengers. Conversely, the ordinary ticket was higher in its percentage of passengers than percentage of revenue. See FIGURE 4.5.

This indicates that the fare is still an important factor for the railway passenger while choosing the kind of MR service. The ordinary ticket is meant for the day and night mail train and night sleeper, which is sometimes referred to as 'ordinary service'. The revenue figures shown in TABLE 4.4 do not include supplementary payments for sleeping accommodation in second and first class, because these are categorised separately. The ordinary service is slower than the express. Other facilities on the train are also of a lower standard than those on the express service. These factors of course mean the ordinary fare is cheaper than the express service fare. See TABLE 4.6 for example.

**TABLE 4.6**  
**MR FARES FOR THE ORDINARY AND EXPRESS SERVICES FOR BUTTERWORTH-  
KUALA LUMPUR AND KUALA LUMPUR – JOHORE BHARU (MALAYSIAN \$)**

| TICKET TYPE                           | BUTTERWORTH TO<br>KUALA LUMPUR |           |       | KUALA LUMPUR TO<br>JOHORE BHARU |              |           |       |              |
|---------------------------------------|--------------------------------|-----------|-------|---------------------------------|--------------|-----------|-------|--------------|
|                                       | 3rd<br>Class                   | 2nd Class |       | 1st<br>Class                    | 3rd<br>Class | 2nd Class |       | 1st<br>Class |
|                                       |                                | NonAC     | Air C |                                 |              | NonAC     | Air C |              |
| Ordinary                              | 13.20                          | 21.40     | –     | 47.40                           | 12.50        | 20.30     | –     | 45.00        |
| Rakyat Express and<br>Sinaran Express | 17.00                          | 25.00     | 28.00 | 54.00                           | 16.00        | 24.00     | 27.00 | 51.00        |



#### 4.6 Elasticity range from literature

Many of the previous studies calculated elasticities by the aggregate modes bus, train, metro or other mass transportation (see Chapter Five). This is considered as a major one of the limitations of those studies. There seems to exist considerable competition between modes of transport. In the case of MR, it faces stiff competition with bus or luxury coach for long distance journeys. In fact the first class trains have to compete more and more with the national airline (MAS). So the aggregate elasticity measurement is unable to represent a particular type of transport as accurately as it should. APPENDICES (H-1 and H-2) list the elasticity measurements, clearly mentioned in those studies, as referring to rail alone or bus and rail only. Hopefully these ranges are much more apposite as guidelines to the MR fare elasticity estimate.

The assembled estimates of fare elasticities shown in APPENDICES (H-1 and H-2) range widely from  $-0.1$  to  $-1.8$  but most of them fall substantially below  $-1.0$ . One study concluded that for the urban area service, small cities have larger fare elasticities than large cities – LAGO et al (1981). Another collected study – KEMP (1973) quoted the fare elasticity range from  $-0.1$  to  $-0.7$  (the smaller values being associated with large cities, central areas and peak hours).

The recent studies have distinguished between short term and long-term elasticity estimates, which one of them gives as  $-0.69$  for short term and more than  $-1.0$  for the long-term – GOODWIN (1988). This indicates that whenever people are given a longer time to adjust to the new fare, their travelling habit, place of work or other factors (income, number of household, car ownership, employment etc.) will change. In this case the long-term was considered as a period of more than five years.



Previous studies showed that the long-distance market was characterised by substantially higher price and service quality elasticities than those found in the short distance sector. Long-distance travel was normally defined as that over 25 miles or 40 km. Following this definition, the MR market on the main line under study is for *long distance* travel.

In a developed country like Britain, the BR intercity market average elasticity of  $-0.8$  was assumed in the main line electrification study of 1981, WHITE (1986). Although rail is considered as having a better market share compared to coach and car for the long distance journey, its price elasticity is quite high (approaching  $-1.0$ ); that is for business travel, while for non-business travel, elasticity of greater size than  $-1.0$  may be assumed – WHITE (1983). A value of  $-1.3$  has been obtained in work by Holt and Steer. Express coach price elasticity is around  $-1.0$  too. FOWKES et al (1985) trend studies 1972 to 1981 confirms a high price elasticity of around  $-0.9$  (together with one for employment of almost  $-1.0$ ).

Almost nothing can be found from developing countries or third world countries on elasticity measurement. About three years ago a study on the national transport system in Zimbabwe was carried out by the Swedish International Development Association (SIDA-1985). One of their findings was the total effect of 1% increase on first and second class rail fares; (assuming no change in fuel costs for air fare and car (journey), the demand was estimated to be 0.6% down (which means an elasticity of  $-0.6$ ).

As the starting point to carry out this experiment on MR, we will take the fare elasticity range as  $-0.6$  to  $-1.5$ . (The reasoning behind this is dealt with in a later chapter). This range is chosen with the intention of classifying it into three categories,  $-0.6$  to  $-0.90$  as group A;  $-0.91$  to  $-1.20$  as group B; and  $-1.21$  to  $-1.50$  as group C. The findings from the survey, the MR statistics on passenger numbers, the yearly demand trend (rate of occupancy) and the opinions from the MR personnel as analysed earlier in this chapter will all help to determine in



which group of ranges the market under consideration will fall. When fares are increased without any changes in service level, we expect to see how much is the rise in elasticity.

It has been stated that the fare per km, estimated according to the 1986 price level for second and third class ordinary services, appears to come out lower than the expected average fare. Although costs on their own could not sensibly be used to determine the fare, it is nevertheless an important measure that operators have to look into carefully; because if a unit cost exceeds the fare per km, this indicates an unhealthy financial position and probable aggregate losses on this portion of railway operations. Therefore MR should try effectively to reduce its total variable costs and increase total passenger-kilometres, charging a smaller fare per km in order to maintain a market equilibrium price. This is only what any transport operator would have to charge when fixing fares – unless, of course, their service is unique, and offers all sorts of outstanding facilities to the customer.

#### **4.7 Conclusion**

Although in a stiffly competitive business like public transportation its operators have to study what is the market price before they set their own fare prices, costs still remains a vital factor which they have to consider. If cost per unit (per passenger-load) works out higher than revenue (per passenger-kilometer), this naturally indicates that the business is in a dangerous loss-making situation: BUT there exists what is known as cross-subsidisation, whereby the high load revenue section of a service can offset the low-load, loss making revenue section. It is therefore suggested that cost classification according to service is adopted by MR to complement revenues derived from demand-related services and fare structures. Cost analysis may be additionally required in order to calculate the amount of contribution made by each service towards the fixed costs (revenue *minus* variable cost = contribution).



Customers' opinion, expectation and willingness are important, because their needs, habit, attitude and ability to pay all vary. These factors can be exploited in order to discriminate each fare according to its market. It seems that customers generally are more sensitive towards service quality than fare, which therefore can be varied more readily than would otherwise be the case.

The survey has indicated that:

- (a) MR's market can be segmented according to classes of service, type of train and seasonal peak and off-peak: the latter are closely related to the journey purpose, ie. visiting family/relative(s) in order to celebrate the customary religious festivals.
- (b) Train is still a good choice to travel with - especially the express services, which offer more facilities in terms of comfort, travel time, and safety.
- (c) Train fares are reasonable and the travelling public are willing to pay extra, so long as the service quality is also improved.
- (d) There is a tendency for demand to increase on the commuter service up to around 30-40 km distance from Kuala Lumpur, Ipoh, Johore Bharu and Butterworth. Therefore if MR can cater for this commuting demand especially with a special discount for seasonal ticket holders, they may well increase revenue from this segment of the market.

Occasional visiting public represents MR's biggest overall market, with commuting/business trips taking a much smaller percentage (only about 21% of survey respondents). This comprises a very distinctive feature of the MR market compared to those advanced country



railway systems where it may be the other way round – ie. more than 60% business and commuting.

Regarding questionnaire design in the proposed survey during a fare experimental period, this survey hinted that the questionnaire must be made shorter and clearer. The enumerators need more training time to understand the questionnaires and to conduct more meaningful interviews, so as to gather as much information as they can in actuating survey objectives.

The rate of occupancy in 1987 shows that both Southbound and Northbound services carry almost the same load in terms of time/period classifications, while under type and class of service classifications, Southbound takes more passengers, with the one exception of the day mail service, having 64% occupation in class A and 88% in class B. It is notable that the percentage of passenger journeys for 1984, 1985 and 1986 classified according to ticket type confirmed that the southbound carried more passengers than the northbound, or East-coast lines. Therefore MR should reduce the supply of train coaches during the low season and for the low-demand types of service, because running the coaches empty will result in higher costs per kilometre.

This can be understood, as the main destinations in the south lie in the Republic of Singapore – big shopping centres, tourist attractions and business centres. It seems that the southbound is meant more for business and the leisure market, whereas the northbound public travel more for visiting.

These findings suggested that MR needs to re-allocate the direction of each of its services according to its popularity *or*, in order to avoid any possible technical problems arising when they reduce the least popular of their present services, they should introduce special fare offers wherever relevant, rather than stick to a “come what may!” attitude.

MR statistics 1984 to June 1987 showed the increasing importance of express services in revenue collection *but* ordinary services (mail train, night sleeper and local train) still were important in terms of popularity in passenger demand. Hence, MR needs to continue to cater for the 'third class' passenger, comprising mainly the low disposable income class.

Previous work on fare elasticity of demand describes advanced railway systems, with one exception – Zimbabwe (a third world country). All studies prove that there exists variability of elasticity values according to time, travel purpose, place and population, all of which help determine demand. It appears impossible to transfer or to apply the elasticity found in one railway system to others, especially with different transport features, and different types of socio-economic background. On the other hand, as a starting point for applying the fare elasticity concept in public transport in Malaysia, one cannot avoid using other countries' experience in elasticity estimates. So it was decided to start with the range of  $-0.6$  to  $-1.5$ , which will be adjusted to the categories of MR demand that have been analysed. Thus, the next task is to use this adjusted range to forecast demand and revenue for certain services chosen for the fare experiment proposal.



## CHAPTER FIVE

### FARE ELASTICITY OF DEMAND IN TRANSPORT

#### Part One – The Concept

##### 5.1 Introduction

This chapter examines the concept of elasticity, its role in the transportation industry and its particular relevance in this study. Part one reviews the concept of demand and elasticity, defining the term, describing its properties; and discussing its usefulness and drawbacks. Part two deals with the introduction of fare elasticity in MR. It includes the determination of elasticity ranges according to time and service type or ticket type.

There are a number of sophisticated mathematical models developed which can be used to predict demand in public transport; but most of them may be too expensive to calibrate and use in terms of the large volume of data required and its automatic processing. This is especially true for developing countries like Malaysia, and particularly for Malayan Railways who are trying their best not to incur unnecessary expenses – for example, to forecast demand using mathematically sophisticated methods. Studies and experiences on public transportation in advanced countries prove that the demand elasticity concept is an inexpensive measure, which summarises the relationship between demand and factors which influence demand (causal variables).

Since the application of this concept in transportation began in the early 1940's the approach to estimate elasticity has been to utilise the available data as collected from the transport operation: this is known as 'revealed preference (RP)'. Less than a decade ago, a new approach was introduced in the transportation industry; called stated

preference (SP), it is now gaining wider acceptance. Therefore one section of this chapter will discuss in more detail about these two approaches (RP and SP), since they will be applied side-by-side in MR fare experimentation.

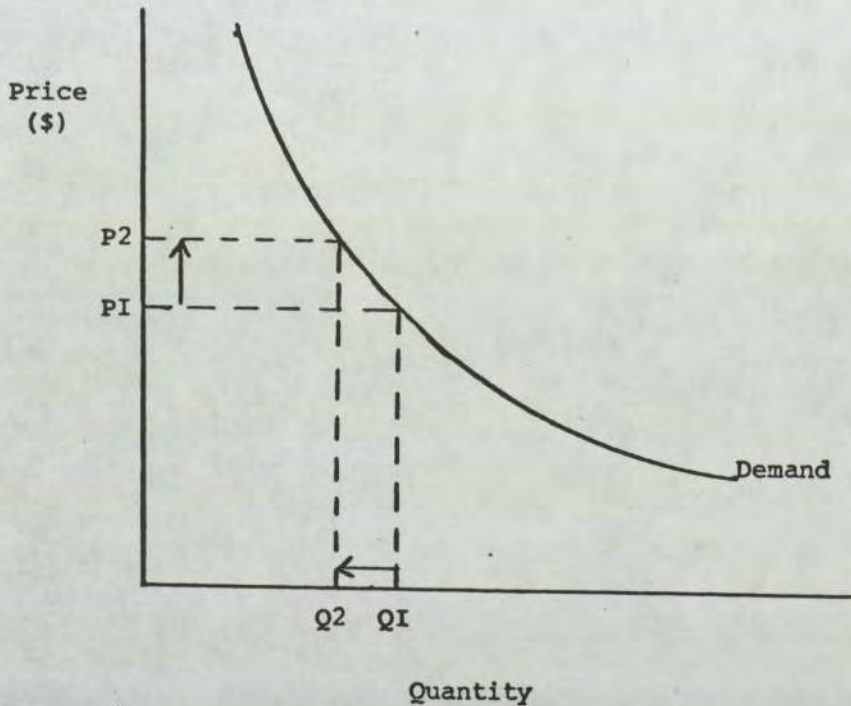
The rest of the chapter deals with reviewing the results of previous attempts to estimate demand elasticity together with other relevant analysed data to be applied as estimated ranges in the MR fare setting. Theoretically this concept will help the transportation operation, but in practice there exists very little evidence which shows that it has been used in any systematic way involving elasticity ranges and fare ranges to forecast demand and revenue according to the very detailed market segment – class of service and type of train. It is possible that BR or other advanced railway systems use this concept in determining their fares, but there is no information about it available in the published literatures. Also BR, by contrast, has a far more complicated market with more than 100 different services operating every day.

## **5.2 Price, demand and elasticity**

Demand curves form by plotting a line throughout the schedule representing the quantity of a good that a buyer wishes to purchase at each conceivable price.



FIGURE 5.1  
DEMAND CURVE



When the price is  $P_1$  the quantity demanded is  $Q_1$ ; then assume price goes up to  $P_2$ , so the quantity moves down to  $Q_2$ .

Any amount by which the price/fare moves either up or down will be followed by a change in the amount of the goods purchased or in this case the number of seats required by travellers. This general kind of relationship can be explained more precisely by the elasticity of demand concept ie. the exact amount of demand changes due to specific price changes. In the normal behaviour of the price movement, when price is increased, demand will drop and vice versa; therefore the elasticity is always designated with a negative sign. If abnormal market conditions exist, where price increases are followed

by demand rises, (both positive movements) or when price drops, demand also decreases,

(both negative movements), it is called inverse elasticity. Generally the elasticity of demand is defined as the summary of the responsiveness of demand to changes in the factors determining the level of demand.

$$E = \frac{\text{the proportional change in demand}}{\text{the proportional change in the explanatory variable}}$$

In transportation, the explanatory variables can be fares, socio-economic factors of travellers and the elements in the quality of service such as frequency, comfort, travel time, reliability, safety and so on.

However, in reality this quality of service cannot be quantified (apart from approximations regarding frequency, travelling and waiting time etc). One is left without a clear-cut solution to estimating the specific amount that should be given as a percentage change for the denominator of the above equation.

It is important to bear in mind that the elasticity measure at one point for a particular service at a particular time will not necessarily reflect the elasticity of the same service at another time or another point. Nobody will be able to produce a nice smooth demand curve for the elasticity of any product so perishable as a transportation service, with the very small possible exception of a commuter service (in Malaysia commuter services comprise less than 5% of the MR market). However, this situation (on commuter services) is also untenable, because in those places where there exists other forms of public transport (like bus service in Malaysia which is more frequent, easy of access and able to offer door-to-door service) the commuters which do not hold a seasonal travelcard or season ticket will readily move from train to bus. This is not nearly so



likely to occur in countries like Britain and France where there exists a much more stable demand for rail commuter services.

The elasticity concept in transportation is more complicated than it is for most other products – for example staple food items. Transportation does not have a single elasticity – even for a day service, because the latter can be divided into peak and off-peak. It varies from time to time of the day, mid-week to weekend, between one season and another. It also depends on the personal factors of the individuals such as income, car ownership, age, employment etc. In transportation, people do not travel because they enjoy travel (except for the sightseeing tourist) but because of what they have to do or obtain at their destinations.

Only in some cases is travelling compulsory – where workers have to go to their workplace, students to their college or businessmen to their dealing points. In the very broad category the market can be divided into two - frequent travel (commuters) and occasional (non-commuters). The latter can be classified further into smaller market segments, usually leisure-orientated, such as visiting, shopping, holidays, other leisure activities: also included could be occasional important travelling: police, army, government\*officers, medical or family affairs.

Therefore each different segment has a different demand curve, in fact a given segment such as second class express train, will have separate curves representing the peak season and the off-peak season. This is because demand increases substantially in the peak season and falls during the off-peak season (in this study sometimes referred to as the normal season). One could draw an average demand curve to represent every market by studying the market demand trend over certain periods. One has to bear in mind that averaging is not a 'right' approach, but seems to be the only way for MR in the very near future if they indeed intend to apply the concept of elasticity to determine their

The same principle (averaging) will apply to all the elasticity of demand estimates in this study.

However, statistics from the ticket sales alone are not enough in judging what is the likely demand curve. It must be taken together with public opinion on their past and future plans for travel and that can best be gathered from surveys, provided that they have been carried out frequently. Despite the fact that these approaches will not give an accurate result (impossible, since preferences and interests are always changing), the best a railway can do is to set fares, and to forecast demand and revenue by using the elasticity of demand concept.

### 5.3 Type of elasticity

There are three primary types of elasticity which can be used in transportation, namely income elasticities, cross elasticities and direct price elasticities.

#### 5.3.1 *Income elasticities*

These are a measure of the sensitivity of demand for a mode (in this case railway (X) in response to changes in the components of individual income (I)

$$EXI = \frac{\% \text{ CHANGE IN DEMAND OF } X}{\% \text{ CHANGE IN } I}$$



### 5.3.2 *Cross elasticities*

These are a measure of the sensitivity of demand for a mode (railway (X) for example) in response to changes in the components of the fare for other modes (PY)

$$EXP_Y = \frac{\% \text{ CHANGE IN DEMAND OF } X}{\% \text{ CHANGE IN } PY}$$

### 5.3.3 *Direct price elasticities*

These are also known as own-price elasticity - are a measure of sensitivity of demand for a mode to change in each of the components of the price (P) for that mode (in this case railway (X))

$$EXP = \frac{\% \text{ CHANGE IN QUANTITY OF } X}{\% \text{ CHANGE IN } P}$$

Actually all these types of elasticity are unreliable because there are some underlying variables which change over time, and although they may alter demand, remain undetected by transport operators. A change in individual income, for example, instead of resulting in an appropriate increase in demand for rail travel, may result in a slightly modified, unaltered, or even decreased demand for rail travel. As incomes change, so do customers' priorities; and changed levels of income may become absorbed in either inferior or superior goods, whose prices will also change to reflect the changed demand. When travellers earn a higher income, they may switch their preferred mode of transport from train to aeroplane, or they may buy their own car for private travel. If they were previously too poor to travel by train, now they may choose to do so.



In the case of cross-elasticities, if, for example, the bus fare increases, some of the bus patronage may switch to train or car (if available). However, there is the possibility that those who stop travel due to increased bus fares may also change their work or shopping activities, so the anticipated transfer of travellers from bus back to train transpires to be minimal.

Even in the direct price elasticities case, if the fare was increased due to an improvement in quality of service, data from the ticket sales will not reflect the actual fare elasticity of demand. It might go to the extreme extent where increases in fare are followed by increases in demand. A case in point were the MR fare changes in August 1984, which resulted in what appeared to be inverse elasticity.

In spite of the above drawbacks, for the purpose of this research, the direct price elasticity will be adopted with the main assumption that there is no change in quality of service in the short period (at least for about twelve months during experimentation).

If there is any service improvement, then the elasticity estimates can be reviewed with little or no problem, because this calculation was in any case planned to be carried out every four months throughout the fare experimentation period (see Chapter Six). Other causal variables like individual income, consumer preference, competition *etc.* will be considered through the findings of the travellers' opinion survey entailing careful examination and observation of the socio-economic environment of the country. All these factors will be used to adjust the elasticity estimate from time to time, as will be explicated in Chapter Six.

The main reason for choosing the direct price elasticity and not the other two is because this thesis is concerned primarily with fare policy: while income changes (for income elasticities) and rival organisation fares do obviously affect the rail travel which can be



afforded, the actual MR fares (gross elasticities) are taken to be unequivocally the main determinants of demand for rail travel: they appear to enjoy the closest relationship in socio-economic analysis. The focus is to see how to increase revenue through fare policy using the elasticity of demand concept.

#### **5.4 The determinants of price elasticity of demand**

There are three factors which determine whether the price elasticity of demand for a good or service is high (say  $-2.0$ ) or low (say  $-0.2$ ).

- (i) Closeness of substitutes – if there are close substitutes, for example bus to railway, then a small change in railway fare could lead to a big change in its demand.

There are five forms of substitution in passenger transport which can be classified as follows:

- (a) Mode – travellers will choose to travel by other modes if price of one mode is increased. In the case of short-distance, people might just walk or cycle rather than go by other public transport or car.
- (b) Trip frequency – if fare rises, public might reduce their travelling frequency – this refers to non-work trips.
- (c) Trip destination – due to fare increase, people might look for the alternative place to do shopping or other non-works activities.

- (d) Activity – change activities, for example stay at home watching TV rather than go to cinemas or do indoor exercise, walking or cycling rather than go to gymnasium or aerobic class.
  - (e) Activities within the household – trips may be confined for example, shopping been done during lunch-time or on the way home by the same person rather than somebody else having to go out for shopping.
- (ii) Degree of necessity or habits – if it is considered socially essential to visit relatives and parents during Muslim Hari Raya, Christmas, Chinese New Year, (in case of Malaysia), higher transport fares may have little effect on the ridership. If, however, the fare is very low, but people do not have to travel, (for example, stay just a walking distance from their office), the fare will not give any effect on their travelling habit for that particular purpose *eg.* (commuting).
  - (iii) Relation of transportation fare to average disposable income – if the fare is high – (for example, a plane ticket is dearer than a railway fare) the traveller will spend on aeroplane if their income allows them to do so. Also higher incomes will result in more travelling generally (example, for leisure purposes) – so elasticity may be reduced.

Since this study is focussed on the effect of price changes in the railway service to the ridership, it is useful to discuss more detail in this area.

There are four types of price elasticities usually being measured, namely, point price elasticity, arc price elasticity, linear elasticity and shrinkage ratio.

Note: from now onwards price elasticities of demand for railway services refer as  $E_p$ .



## 5.5 Price elasticity of demand

### 5.5.1 *Point price elasticities*

Point price elasticities are the ratio of the proportional changes in demand to the proportional changes in price at a succession as single points along a demand curve.

$$\text{In general – } E_p \text{ point} = \frac{\% \Delta x}{\% \Delta p}$$

Where  $E_p$  point – point price elasticity.

$\Delta x$  – changes in demand

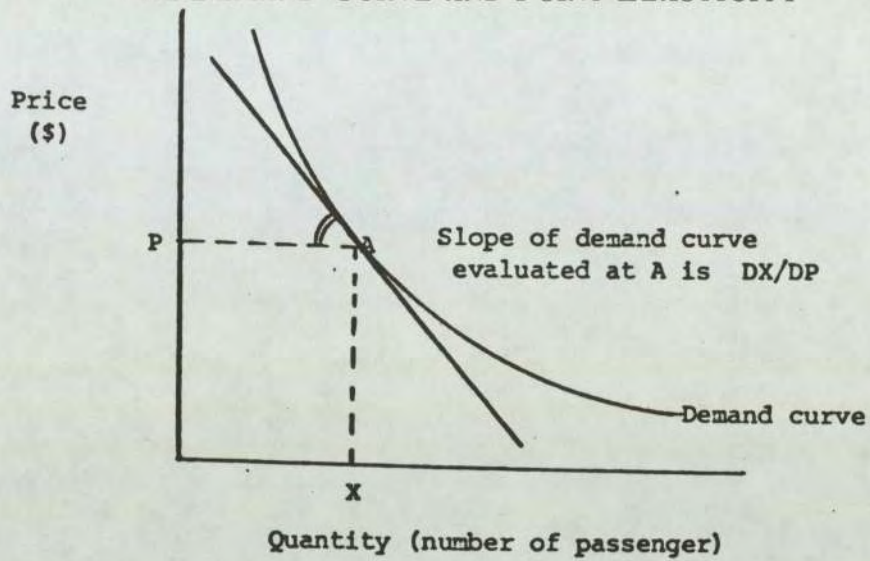
$\Delta p$  – changes in fare

The percentages are compiled by comparing the change of volume to the original value.

$$E_p \text{ point} = \frac{\Delta x/x}{\Delta p/p}$$

FIGURE 5.2

THE DEMAND CURVE AND POINT ELASTICITY



$$E_p(\text{point}) = \text{Limit} \frac{\Delta x}{x} \frac{\Delta p}{p}$$

$$= \left[ \frac{P}{x} \right] \left[ \frac{\delta x}{\delta p} \right]$$

.....Equation 5.1

Where, in the limit of the changes being vanishingly small,  $\frac{\delta x}{\delta p}$  is the partial derivative of the demand function with respect to the fare.



There follows now an example of how the point elasticity is calculated.

### EXAMPLE 5.1

|            | FARE   | NUMBER OF PASSENGERS |
|------------|--------|----------------------|
| ORIGINAL   | £10.00 | 100 passengers       |
| CHANGES TO | £9.50  | 110 passengers       |

$$\begin{aligned}
 E_p (\text{point}) &= \frac{(110 - 100)/100}{(9.50 - 10)/10} \\
 &= \frac{10\%}{-5\%} \\
 &= -2.0
 \end{aligned}$$

There are two limitations in using point price elasticity of demand, which are:

1. According to Road Transport Research. *“Unless the shape of demand curve is known, knowing the elasticity value at one particular point does not provide information about the elasticity at a different point. Therefore it cannot in general be used to forecast the effect on demand if there are big changes in explanatory variable. One exception to this limitation is by using ‘arc elasticity’ (TRRL, 1980)”*

2. If there were two changes in fare, each in the same amounts, one an increase and another a decrease the point price elasticity will give different answers.

Using the same figures as in example 5.1 but instead of from £10.00 to £9.50, from £9.50 to £10.00.

#### EXAMPLE 5.2

|            | FARE   | NUMBER OF PASSENGERS |
|------------|--------|----------------------|
| ORIGINAL   | £9.50  | 110 passengers       |
| CHANGES TO | £10.00 | 100 passengers       |

$$E_p (\text{point}) = \frac{(100 - 110)/110}{(10 - 9.5)/9.5}$$

$$= \frac{-9.5\%}{5.26\%}$$

$$= -1.73$$

Though the different (absolute number) in examples 5.1 and 5.2 is £0.50 for fares and 10 for passengers, their elasticity values (−2.0 and −1.73) are absolutely different. To avoid such discrepancies, which result from the use of different bases, we employ arc price elasticities.



### 5.5.2 Arc price elasticity

Arc price elasticity is used to measure the responsiveness of demand to the changes of price – either increase or decrease – by using the same basis. It refers to responsiveness between two points.

For very small changes, arc elasticity will be very close to the shrinkage ratio  $S$ , (see equation 5.5). For large changes, however, arc elasticity will be numerically larger than  $S$  for the increases, and numerically smaller for fare decreases. Normally the equation for arc elasticity is:

$$*E(\text{arc}) = \frac{\text{LOG } X_2 - \text{LOG } X_1}{\text{LOG } P_2 - \text{LOG } P_1} = \frac{\Delta (\text{LOG } X)}{\Delta (\text{LOG } P)} \quad \text{..... Equation 5.2}$$

Where:  $X_2$  is the present demand  
 $X_1$  is the previous demand at the previous fare  
 $P_2$  is the new fare  
 $P_1$  is the previous fare

\* Equation by collaborative study TRRL (1980).

However, the various elasticity measurements have been called by other names, and the term “arc elasticity” has also been applied to an elasticity calculated at the mid-point between two observed demand values by assuming that the demand curve connecting the two points is a straight line. Thus, when some writers use the term linear elasticity the formula is the same as mid-point elasticity, or arc elasticity for the large changes. Unfortunately, from dozens of articles which have been scanned, none of them show the difference between small changes or large changes in numerical form. Therefore the

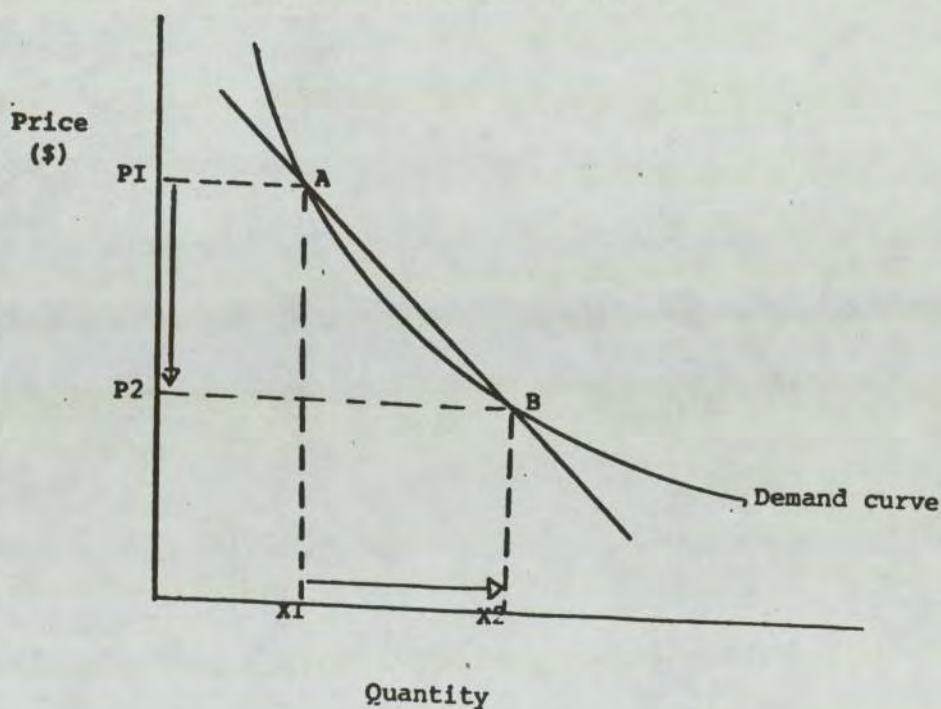
following equation is for mid-point elasticity, arc elasticity (see FIGURE 5.3 for example) and linear elasticity.

$$E = \frac{(x_2 - x_1)}{.5 (x_2 + x_1)} + \frac{(p_2 - p_1)}{.5 (p_2 + p_1)}$$

$$= \frac{(x_2 - x_1)}{(x_2 + x_1)} \times \frac{(p_2 + p_1)}{(p_2 - p_1)} \quad \text{..... Equation 5.3}$$

FIGURE 5.3

DEMAND CURVE AND ARC PRICE ELASTICITY, MID-POINT ELASTICITY  
AND LINEAR ELASTICITY



Since the responsiveness of X to price changes is the same between A and B, the different elasticity coefficients we compute are due to the choice of different bases in computing percentage changes. This problem may be solved by selecting a base that is neither the beginning nor ending base but the average of two, *ie.* the mid-point base.



$$E_p (\text{arc}) = \frac{(\Delta X)}{(\Delta P)} \cdot \frac{(P_1 + P_2)/2}{X_1 + X_2/2} \quad \text{..... Equation 5.4}$$

Referring to Example 5.1 and 5.2 above, we calculate the average fare and average number of passengers:-

$$\text{Average fare:} \quad \frac{10 + 9.5}{2} = \text{£}9.75$$

$$\text{Average ridership:} \quad \frac{100 + 110}{2} = 105 \text{ passengers}$$

Therefore if either the fare reduced from £10.00 to £9.50 or increased from £9.50 to £10.00 – and the number of passengers increased from 100 to 110 or, reduced from 110 to 100 respectively, the arc price elasticities are:

$$\frac{(10 - 9.5)/9.75}{(100 - 110)/105} = -0.54 \text{ (fare increase)}$$

$$\frac{(9.50 - 10)/9.75}{(110 - 100)/105} = -0.54 \text{ (fare decrease)}$$

Using the above equation of mid-point elasticity is also not practical because in reality the demand curve is not linear (or a straight line) due to the complexity and nature of railway operations, which depend on consumers' preference and habits.

Even by using one particular type of elasticity such as arc will give a different elasticity value for each different size and direction of the fare movement - for example: if the fare increases by 20% from 80 cents to 96 cents, the average demand drops from 500 to 475 passengers, a decrease of 5%. These changes result in an arc price elasticity of -0.25. If, however, the fare is raised another 14 cents from 96 cents to \$1.10, an increase of

about 15%, the demand decreases 7.4% from 475 to 440 passengers, yielding an arc price elasticity of  $-0.49$ . In this hypothetical case, the absolute value of the arc price elasticity changes in the same manner as point elasticity (cf. examples 5.1 and 5.2).

For the above non-linear relation, the arc price elasticity also depends on the direction of change in the initial fare. For example, if the fare is raised 5%, the demand drops 10% and the resulting elasticity is  $-2.0$ . However, if the fare is dropped 5% and demand increases 15% from the initial figure, the resulting arc elasticity is  $-3.0$ . The fare reduction obviously has a greater effect on demand than the equivalent fare increase. Nevertheless circumstances are not the same at all times: sometimes the fare reduction is followed only by a small percentage increase in demand or no change in demand at all, and vice versa. Hence, in practical terms, this concept cannot be applied in a fancy mathematical way: but it will help as a guide to transport operators in moving the price according to *elastic*, *unit elastic* and *inelastic* market demand.

### 5.5.3 Shrinkage ratio

This type of measurement is often used by bus operators to summarise the effect on demand caused by changes in the fare.

$$Ep(S) = \left[ \frac{p_2 - p_1}{x_2 - x_1} \right] \left[ \frac{x_1}{p_1} \right]$$

..... Equation 5.5

**Notes:** Except for the large changes in fare, the equations 5.3 and 5.5 take on broadly similar values; when the change is infinitesimal they all utilise a point elasticities measure, as in equation 5.1.



The shrinkage ratio measurement will not be discussed in detail because it is not popular among the railway systems. This is because the calculations seldom match operating experience in reality: they nevertheless have some relevance to systems where fare changes occur regularly and thus permit experience to be accumulated on a real basis. According to GREY (1975) *the shrinkage ratio has asymmetrical behaviour and ambiguous translation into revenue impacts.*

Simpson and Curtin (1968) have found a shrinkage ratio of  $-0.33$ , which means for every 1% increase in the fare there occurs a ridership loss of 0.33% but revenue will increase by 0.67 *ie.* change from 100% to 106.7%. Therefore if the fare increases by 2% , demand will reduce by 0.66% and revenue will increase by 0.33 *ie.* change from the original 100% to 103.4%: thus, the higher the fare increase, the more demand will shrink, and revenue will start decreasing in the proportionate figures of 0.33%.

The reason for widespread use of the shrinkage ratio in the transportation industries (particularly bus in the USA) have never yet been explained anywhere in the literature: Curtin's rule is taken as 'rule of thumb'.

## 5.6 Elasticity and total revenue

In economic terminology, when elasticity is numerically *more than minus one*, the demand is considered "elastic"; *minus one*, is "unit elastic" and *less than minus one* is 'inelastic'. Since price and quantity are inversely related, the coefficient of price elasticity of demand is a negative number. In order to avoid dealing with negative values, a minus sign is often introduced to the formula for *elasticity* – (DOMINIC 1974).

If demand for a good or service is **elastic**, a reduction in price will increase total revenue provided that the percentage increase in demand is bigger than the percentage

reduction in price. If demand is **inelastic**, an increase in price will increase revenue provided that the percentage increase in price is bigger than the percentage decrease in demand. In case of **unit elastic**, normally the fare changes, either upwards or downwards, followed by a decrease in revenue or in some cases constant revenue.

There follow some examples of the effect of the fare reduction and fare increase in the three situations of demand elasticity – elastic, unit elastic and inelastic.

### EXAMPLE 5.3

Fare reduced from \$10 to \$9 = 10% decrease (–).

Original demand 200 passengers

|                      |                     |              |           |
|----------------------|---------------------|--------------|-----------|
| New demand           | 210                 | 220          | 230       |
| % increase in demand | +5%                 | +10%         | +15%      |
| Fare elasticity      | 5+10                | 10+10        | 15+10     |
| =                    | -0.5                | -1.0         | -1.5      |
|                      | inelastic           | unit elastic | elastic   |
| Original revenue     | 200 @ \$10 = \$2000 |              |           |
| New revenue          | 210 @ \$9           | 220 @ \$9    | 230 @ \$9 |
|                      | \$1890              | \$1980       | \$2070    |
| Compared to original | decrease            | decrease     | increase  |



#### EXAMPLE 5.4

Fare increased from \$10 to \$11 = 10% increase (+)

Original demand 200 passengers

|                      |                     |              |          |
|----------------------|---------------------|--------------|----------|
| New demand           | 190                 | 180          | 170      |
| % decrease in demand | -5%                 | -10%         | -15%     |
| Fare elasticity      | 5+10                | 10+10        | 15+10    |
| =                    | -0.5                | -1.0         | -1.5     |
|                      | inelastic           | unit elastic | elastic  |
| Original revenue     | 200 @ \$10 = \$2000 |              |          |
|                      | \$2090              | \$1980       | \$1870   |
| Compared to original | increase            | decrease     | decrease |

The above examples illustrate that if the demand is inelastic, the fare should be reduced in order to increase revenue; and the fare should be increased when the demand is elastic. However, the fare setter(s) have to work out mathematically what is the optimal decrease or increase in the fare. Optimal here means the fare at which the highest level of revenue contribution can be obtained. Optimal fare points will obviously differ from one case to another, since both fare elasticities of demand and costs of service will differ; so too, the resultant levels of revenue contribution will vary. In extreme cases the loss from a particular service may simply be reduced.

Work by Peat (PEAT et al 1977) shows that when the point price elasticity (PPE) is used to calculate the effect of fare changes on revenue the result will be as follows:

| Nature of Demand | Absolute Value of PPE | Fare Changes | Effect on Demand | Effect on Revenue |
|------------------|-----------------------|--------------|------------------|-------------------|
| Inelastic        | < 1.0                 | Increase     | Decrease         | Increase          |
| Inelastic        | < 1.0                 | Decrease     | Increase         | Decrease          |
| Unit elastic     | = 1.0                 | Increase     | Decrease         | Constant          |
| Unit elastic     | = 1.0                 | Decrease     | Increase         | Constant          |
| Elastic          | > 1.0                 | Increase     | Decrease         | Decrease          |
| Elastic          | > 1.0                 | Decrease     | Increase         | Increase          |

**NB:** Over a limited range (elasticities change as one moves away from current position).

On the other hand, the arc price elasticity (APE) with an elasticity value of more than – 1.0 does not mean that a reduction in the fare will always result in more revenue. See example 5.3 on page 163.

The reason for these drawbacks lies on the definition of the two fares elasticities: PPE involves a very small change in the fare, while APE can involve changes of any size (include the small size as for the PPE) and any magnitude. Therefore APE rather than PPE should be used to determine the consequences of any actual fare changes, since these are likely to be relatively large.

### 5.7 Collecting data to estimate elasticities

Traditionally, travel demand models have been based on data obtained by direct observation of travel behaviour (eg. ticket sales data) or data from surveys which are for



actual travel behaviour. These models are classified as revealed preference (RP) methods. Some of the popular models in this method includes quasi experimental, time-series analysis, before-and-after analysis, cross-sectional analysis, generalised costs studies and equilibrium model. They are a most appropriate tool for deriving utilities and estimating models of travel demand. However, there are a number of limitations which restrict their general suitability such as:

- It can be difficult to obtain sufficient variety in the RP data to examine all variables of interest.
- There are often strong correlations between explanatory variables of interest (particularly travel time and cost).
- RP methods cannot be used in a direct way to evaluate demand under conditions which do not yet exist.
- RP methods require that the explanatory variables can be expressed in objective or engineering units; therefore they are normally restricted to primary service variables (such as journey time and cost) and can in practice rarely be used to evaluate the input of changes in secondary travel variables; *eg.* seat design.

In late 1970's there arose a new approach which has been applied to transport research and is known as stated preference (SP) methods. They have been used in the market research for consumer goods in the last two decades or so. The term SP methods refers to a family of techniques which use individual respondents' statements about their preference in regard of a set of transport options and are used to estimate utility functions. The best known methods falling in this category are conjoint analysis, functional measurement, trade-off analysis and the transfer price method.

However, SP methods have some disadvantages, one of them which is very obvious is that people may not necessarily do what they say. This will only become serious under conditions where research undertaken to estimate demand levels uses only SP data.

SP methods have proved useful in the following transport research areas:

1. Evaluating passenger priorities for the development of various characteristics of public transport systems, with a special emphasis on qualitative factors (marketing audits).
2. Estimating demand elasticities for various service attributes, including fare, frequency and journey time.
3. Developing market share analysis and forecasts for transport operators and for managers of airports and coach terminals.
4. Undertaking route choice studies (eg. for cars and bicycles).
5. Researching and developing new products for transport operators.
6. Conducting planning studies for government bodies (for example, value of time studies).

The SP methods became an attractive option in transport research with the following advantages:



- (i) these methods are easier to control (because the researcher defines the conditions which are being evaluated by respondents).
- (ii) they are more flexible (being capable of dealing with a wider variety of variables).
- (iii) they are cheaper to apply (as each provides multiple observations for variations in the explanatory variable which interest the analyst).
- (iv) the computer-based approach (if the organisation understandably can afford to use it) also allowed us to use a rather unique method for collecting the choice information and the programme like MONANOVA (monotonous analysis of variance) or ALOGIT package can straight away produce the result of the elasticity measured after every interview.
- (v) a recent study suggests an easier way of expressing conjoint choice would be to reduce the number of choices from 9 to 12 down to only 1 to 2 depending on the type of study.

It is important to bear in mind that most applications of SP in transport research are intended to identify estimates of relative utility weights rather than absolute values. Estimates of SP methods in conjunction with RP methods offer an attractive solution which avoids the problem of stated intention/revealed behaviour.

Revealed preference models must rely on assumed functional forms that, at best, can be tested only weakly and must cope with biases introduced by unobserved attributes. On the other hand, the stated preference (also known as laboratory simulation models), can

control for these potential sources of bias by appropriate design techniques before data are collected.

Despite the disadvantages of both RP and SP, many transport studies, such as that for the Very Fast Train (VFT) project in Australia (Hensher, Broatch and Gun, 1989), have tried to combine these two methods for forecasting and planning.

Therefore, both RP and SP approaches are complementary to each other. One is strong where the other is weak, and vice versa. For the purpose of this research, we intend to use both methods. *The use of SP methods became an attractive option in transport research because they are easier to control, more flexible and cheaper to apply* – KROES (1988).

## **5.8 Evidence from the application of elasticities concept**

Having scanned through a number of articles, some important points emerged about elasticity. There is variability of elasticity according to different kinds of market segment. The market can be segmented according to the time, journey purposes, type of service offered and the public's personal characteristics. An example of variability of elasticity is given by British Rail. In a week, Monday to Friday tend to be very busy where certain times are peak and other times are off-peak. If this section of time be segmented further, there are peak for leisure (example during summer holiday) or non-peak leisure, peak for business travel and non-peak for business travel and so on.

Anyhow, we still can extract from the literature some guidelines on the nature of fare elasticity of demand and demonstrate their variability.



A number of studies in mass transportation using the elasticity of demand concept have been done in the advanced countries. The four types of evidence were analysed by KEMP (1973), and are summarised as follows:

- Evidence from transit operating statistics
- Evidence from the analysis of operating data time series
- Evidence from transit demonstration projects
- Evidence from cross-section models of modal choice.

#### **5.8.1      *Evidence from transit operating statistics***

- (a) Simpson and Curtin (1968) with shrinkage ratio of  $-0.33$ , which means for every 1% increase in fare, the ridership reduces by .33 of 1% (and the revenue increases by 106.7%).
- (b) Schneider (1965) a shrinkage ratio of about  $-0.7$  among privilege card holders for public transit (aggregate).
- (c) Cantor (1970) a shrinkage ratio of  $-0.5$ .
- (d) London Transport – National Board for Prices and Incomes (1968) – 14% rise in fares for bus would lead to a 6% fall in passenger journeys, equivalent to an overall shrinkage ratio of  $-0.43$ .

#### **5.8.2      *Evidence from the analysis of operating data time series***

- (a) Rainville (1948) – this study involved three models: Model A  $-0.1$ , this model resulted in very low elasticity because it deflated the average fare for each year by

a measure of purchasing power. Model B and C – gave the point elasticity between  $-0.6$  to  $0.9$ .

- (b) Carstens and Csanyi (1968) – gave a point fare elasticity of  $-0.8$  to  $-0.9$ .

Both (a) and (b) studies were on bus service.

#### **5.8.3      *Evidence from transit demonstration projects***

- (a) Schroeder (1954) Chicago Transit Authority, (1950's) implied shrinkage ratio of  $-0.2$  for bus fare.
- (b) Eastern Massachussetts Street Railway company, implied shrinkage ratio during peak hours as  $-0.6$ .
- (c) Maloney (1964) – from the studies on a number of rail and bus lines, it was concluded that the demand for transport is more sensitive to the service level rather than fare.

#### **5.8.4      *Evidence from cross-section models of modal choice***

WARNER (1962) used 1956 data from a survey in Cook County, Illinois to focus on the binary choice between work downtown. His findings were:

- elasticity of transit usage with respect to transit fare is  $-0.96$ .
- elasticity of auto usage with respect to transit fare is  $-0.21$ .



This particular example showing the cross-elasticity of auto demand with respect to transit fare, which summarises the degree to which people can be diverted into or out of the cars by changing the money price of public transport modes.

A study by BLY (1976) has produced a comparative mean fare elasticity which was obtained from all sources of studies as discussed earlier in this chapter, in the UK, USA, West Germany and other countries (France, Netherland, Italy and New Zealand) for the bus and rail services from 1957 to 1973 as follows:

| Countries       | Mean elasticities            |
|-----------------|------------------------------|
| UK              | $-0.30 \pm 0.02$ (79 values) |
| USA             | $-0.41 \pm 0.05$ (35 values) |
| West Germany    | $-0.34 \pm 0.04$ (13 values) |
| Other countries | $-0.32 \pm 0.10$ (5 values)  |

Source BLY (1976) pp6.

This means that the mean fare elasticity for transportation in advanced countries is about  $-0.3$  to  $-0.4$ .

Another well documented study on the fare elasticity of demand was done by Road Transport Research (OECD Scientific Expert Group (1984)) where some of their results are:

- (a) The common range for the bus fare elasticity in the urban area in many parts of the world is  $-0.1$  to  $-0.6$  or around  $-0.3$ .
- (b) Short-distance journey is more elastic than long-distance journey. Travel over short distance (could be by foot) is more elastic between  $-0.3$  to  $-0.6$ ; over longer distances,  $-0.1$  to  $-0.3$ , but over much longer distances elasticity increases again.
- (c) In the short term, off-peak fare elasticities are likely to be twice those in the peak. Shopping and leisure trips may switch destinations or be by-passed entirely.
- (d) Those who have a car but choose to travel by public transport have higher elasticity than those without a car when the fare is increased.
- (e) There is slightly different elasticity between male and female travellers, where the former is less elastic than the latter.
- (f) Children's travel is more sensitive to price than that of adults.
- (g) Low income passengers are more concerned about fare increases than high income passengers, but this situation is confused by car ownership in the higher income group.

A report from Hughes (HUGHES, P (1980)) after his analysis of 62 flows of BR service (each with a destination in Central London) over a period of  $\pm 5\frac{1}{2}$  years quoted the following result.



| TYPE OF TICKET      | ELASTICITIES         |
|---------------------|----------------------|
| Reduced fare ticket | -1.0                 |
| Full fare           | -0.7                 |
| Season ticket       | Between -0.2 to -0.4 |

Source HUGHES, P (1980) pp9.

A work by Nash (NASH, CA (1982) pp110) concluded that, for rail in London elasticity appears much lower (perhaps -0.1) assuming bus fare and rail fare increase in proportion. If the changes for bus fare and rail is unmatched, 1% increase of rail fares caused 0.25% rail traffic transfer to bus (ie. elasticity of -0.25). In the similar study, Nash has cited the work by (ECMT, 1971) where Paris Metro has -0.2 elasticity, and work by (KRAFT and DOMERICICH, 1972), where they found out in Boston the elasticity for rail service is -0.19 for work trips and -0.32 for shopping trips.

Lago, Mayworm and McEnroe (LAGO et al 1981) had analysed 60 studies of transit fare elasticities. In their compilation they relied on the concept of mid-point elasticities. The following are their findings on aggregate fare elasticities, means and standard deviations.

| TYPE OF MODEL                                     | ELASTICITIES MEANS AND STANDARD DEVIATION |
|---------------------------------------------------|-------------------------------------------|
| 1. Monitoring fare changes demonstration studies. | $-0.28 \pm 0.16$ (67 cases)               |
| 2. Non-experimental times series.                 | $-0.42 \pm 0.24$ (28 cases)               |
| 3. Non-experimental cross-sectional.              | $-0.53 \pm 0.35$ (28 cases)               |

Source: Lago, Mayworm and McEnroe (1981) pp120

Notes: In transportation studies, *aggregate elasticities* refer to the elasticities on all types of public transport – bus, rail, tube, tram etc.

The same report also revealed that the work trips elasticities is  $-0.07$  while the shopping trips came out with  $-0.20$  elasticities. This conclusion is from quasi-experimental data taken from Baltimore in 1976, Richmond in 1976 and Birmingham, Alabama in 1975. (These refer to the cities in USA). Again, this study was on the public transportation in general or at least on railway and bus.

There are some published works on elasticity measurement in 1980's which can be quoted from BR. SHELDON and STEER (1982) who used SP methods for Inter-City, came out with three groups of elasticity – namely, commuting  $-0.3$ , business trips  $-0.7$  and optional purpose (shopping, leisure etc.)  $-1.4$ . FOWKES (1985) who did the analysis on intercity BR flow of 1972-1981, has discovered a fare elasticity of  $-0.49$  for non-London based for less than 100 miles distance and  $-0.86$  for more than 100 miles



distance. KROES (1985) also used SP methods on BR obtained elasticity of  $-1.5$  when fares go down but a smaller elasticity, when fares had gone up, of only  $-1.2$ . OWEN and PHILIP (1987) came out with fare elasticity on intercity service of  $-0.3$  for commuting and for the optional purpose there were two figures given, short term with  $-0.69$ , while the long-term fare elasticity is  $-1.08$ .

There is one significant figure for commuting ie.  $-0.3$  although they were obtained from two different approaches – Sheldon and Steer (1982) used SP methods, whereas Owen and Philip (1987) used RP methods. Thus in certain cases, the RP and SP methods will result in the same elasticity value. However in many cases, they will be different since the former deals with the actual behaviour and the latter with the travel plans of certain numbers of survey samples.

The latest studies were compiled by GOODWIN (1988), where some of the findings are for the railway fare elasticity of demand from 1980-1988. They are:

| PLACES/RESEARCHERS/PURPOSES                            | ELASTICITIES |
|--------------------------------------------------------|--------------|
| All London base                                        | -0.79        |
| Unambiguous commuting                                  | -0.31        |
| Non-London base                                        | 0.67         |
| Foreign                                                | -0.66        |
| Provincial sector – BR’s figure                        | -0.9         |
| London commuter if season ticket is changed - Glaister | -1.1         |
| Reduced fares – Hughes                                 | -1.01        |
| Jones et al finding                                    | -1.2         |
| Commuting journey – Mackett’s model                    |              |
| to inner London                                        | -1.5         |
| to other destination                                   | -1.1         |

He summarised that the elasticities for the passenger transportation demand with respect of fares are:

| Types of Modes | Elasticities |           | Not distinguished |
|----------------|--------------|-----------|-------------------|
|                | SHORT-TERM   | LONG-TERM |                   |
| Bus            | -0.3         | -0.65     | -0.41             |
| Rail           | -0.7         | -1.11     | -0.65             |

Note: Long-term typically in the range of 5-10 years, but may be more.

This summary shows that rail service has greater elasticities than bus service. This is an example of how wrong it is to aggregate the elasticity estimate for the whole country, as found by BLY (1976).

The fare elasticity figures since 1940's until 1988 (all types of transport) are in the range of -0.07 to -1.81 with most of them falling between -0.2 and -0.7, particularly in -0.3 value. They can be classified according to the places/countries, journey purpose, distance, type of model used, type of ticket, time (peak or off-peak), direction of fare changes (increase/decrease), time lag (short-term or long-term). All of the studies except one are on the railway or public transport in the developed countries. The sole study which can be quoted here in a developing country or third world on fare elasticity of demand is in Zimbabwe in 1985 which produced fare elasticity of -0.6 for the rail passenger service, SIDA (1985).

In summary, the fare elasticity of demand appeared to be as follows:



- (a) Long run fare elasticities to be probably higher than the short run fare elasticities.
- (b) During the week, off-peak journey is more elastic than the peak.
- (c) Bus traffic to be more elastic than rail travel where both exist side-by-side. This refers to the major cities only.
- (d) The following features are very close related to each other, which are:
  - (i) non-business travel demand is relatively more elastic than business travel.
  - (ii) Commuter journeys are less elastic than non-commuter journeys; the longer distance rail commuter has higher fares elasticity.
  - (iii) Weekend traffic to be more elastic than weekdays.

Normally, businessmen travel very often, and prefer to have a return ticket. Some of them in fact travel as often as those workers who commute everyday from their home to their workplaces. In this case the season ticket happened to be their choice of ticket type. Their travel times are during peak in the morning, to work and in the evening after work from Monday to Friday. The fare increase does not effect their travel pattern in the short run.

Details on some of the examples quoted in this section (evidence on the fare elasticity of demand works) can be found in Appendix G. Appendices H-1 and H-2 exhibit the summary of compilation studies from 1970's on rail and rail combined with bus.

## 5.9 Conclusion

Complexity in the nature of railway services has made it impossible to demonstrate a linear demand curve or smooth non-linear curve. The demand depends on the type of service offered – like ordinary train and fast train, which both of them have different standards of sitting and sleeping accommodation. This is influenced by the consumers' preference, ability to pay and the degree of necessity for travel. All these factors lead to variability in elasticity of demand. This elasticity can become even more varied, since there are several different types of elasticity which can be measured – for example, point price elasticity, arc price elasticity, shrinkage ratio and so on.

Therefore all attempts to measure elasticity are essentially estimates; and researchers or others who involve themselves in estimating elasticity can manipulate their results by using different types of elasticity measurement. They can interpret or redefine the equation according to what they think is the best for their work. None of these elasticity formulae can be applied in a strict mathematical sense, partly because of the problems in data collection: the figures derived from any calculation will not possess much meaning until they become used for other purposes, such as to forecast demand as well as revenue and to be used for planning services or for fare determination.

Since the elasticity to be used for demand forecasting can only be estimated, the question of how accurate is the forecast depends on what model was used. Therefore there exists no way of knowing in the present state of the art whether the outcome may be true or false. Take for example, the weather forecast; even though it is done everyday, it is by no means right all the time. Thus, in fare elasticity of demand, ranges rather than an exact figure or mean figure should be used, for this affords some flexibility to move around within the range.



Although the fare elasticity of demand measured can never be accurate, yet one still can predict the likely demand for the year: this is related to which part of the day, the week or the year, or which services (according to train type and ticket type) are inelastic (less than  $-1.0$ ) and which are elastic (more than  $-1.0$ ). The estimate is only valid for a short period, for instance six months (or less) to a year – because in the longer period a number of changes in the causal variables will change the travellers demand for those services.

Most of the literature which has been scanned through so far, did not mention what type of elasticity measurement has been used. The remainder are mostly using point elasticity or mid-point elasticity, besides shrinkage ratio in a few cases in the United States. According to Dr Nash (Leeds University, Institute of Transport Studies), *“usually these days elasticities are measured as point elasticities from explicit functional forms”*. Anyhow, the equations for all type of measurement except shrinkage ratio are the same to a certain extent, therefore when researchers tend to use only arc elasticities, they may probably take into account this similarity.

However, all those measurements for similar circumstances over a period of time come within range. Similar measures though done in different approaches (SP or RP methods), support each other. The total picture is that, as the same figure of elasticities is found in different railway or different public transport systems, it can be deduced that from the previous studies since 1940, the urban fare elasticity of demand fell strongly between

$-0.1$  to  $-1.0$  and for inter-urban sector like BR intercity is in the range of  $-0.3$  to  $-1.8$ .

The ranges presented here were derived following compilation of the work on elasticity and not as a single self-contained study limited to only one segment of the market (see



Appendices H-1 and H-2). This will give us a valuable guideline to elasticity estimation in the experimental proposal to Malayan Railway.

Besides theoretical reasons against their use, it proved impossible in practice to attempt to use MR data to estimate its fare elasticity. This was due to insufficient and irrelevant data, poor record keeping of data, etc. all of which are discussed in detail in Chapter Three. Therefore the best that can be done at this stage is to detect any consistency in the elasticity estimation of other railways, whenever these are thought to be relevant to MR. Information from other sources will support the estimated values chosen for MR, where all ranges will be entered into simulation of fare changes and their effects on demand and revenue (as shown in the experimental chapter).

After the experiment, it is hoped that MR will possess knowledge of its own fare elasticities according to the different markets they have. Although MR has some similarities with other railway systems, that by itself will never produce an accurate elasticity value; but at least those values from other systems can guide them in setting fares or upgrading their services and help them achieve better returns in their overall revenue.

Accordingly, the implication of applying the elasticity concept in this research is to use the range of previous estimates of other railways or bus services (wherever applicable) as available in the literature, plus other researchers' personal opinions (derived from interview) as a start in estimating MR's own fare elasticity (part two of this Chapter). These ranges then will be adjusted with other data and information as gathered in Chapter Four, followed by fare change simulations, all in Chapter Six.



## **Part Two: Introducing elasticities in MR**

### **5.10 Introduction**

Since MR became well established about 40 years ago, after the Malayan Railway Ordinance had been enacted in 1948, there has been no single study or experiment done on the measurement of any kind of elasticity of demand. It is hoped that this study will instigate a new era for MR, encouraging officers to see how important it is to establish a creative fare structure by using fare elasticity of demand (or a similar research approach), in order to improve their financial position; in other words to increase marginal revenue to meet marginal costs.

The first tariff Book of MR was published in 1956, followed by fare changes 20 years later, ie. in 1976 and the latest tariff was reviewed in August 1984. Since the gap between every fare review is too long, it is impossible to measure the fare elasticity of demand by traditional methods - for example, time series analysis or "before and after" studies.

Within the large time lag between one fare review and another there are also changes in other factors such as public attitude to travelling and spending, income, economic situation, development of the country and so forth. In Malaysia, within the last 10-15 years there occurred drastic changes in those factors. However, the world economic recession also struck the development planning of the country. A number of master plans - for example, the second railway track crossing the middle part of Peninsular Malaysia from Kuala Lumpur to Kuantan and Trengganu - were left aside just as a plan only. The prospects may change for the better in 2-3 years time or so. Extraneous events call forth continuous adjustments in order for MR to optimise its revenue.

### 5.11 'Before and after' analysis

Besides the large period gap between fare reviews, MR also did not keep 'proper' records on the data needed, such as number of passengers, passenger journey, etc. This was due to the typical reasons appertaining to administration and management of an organisation in a Third World country.

It was only about 10 years back that the computer came into use for data storage. It is only because of the researchers' own manual calculations that a sort of "before and after" study approach could be undertaken. We will calculate elasticity in terms of money fare changes.



**TABLE 5.1**  
**MALAYAN RAILWAY FARE ELASTICITY OF 1984 FARE CHANGES**  
**(IN DOLLARS) ACCORDING TO CLASS OF SERVICE**

| CLASS                               | FIRST CLASS              | SECOND CLASS             | THIRD             |
|-------------------------------------|--------------------------|--------------------------|-------------------|
| Passenger Journey:                  |                          |                          |                   |
| 1984                                | 49,000                   | 1,552,000                | 5,033,000         |
| 1985                                | 74,000                   | 1,706,000                | 4,577,000         |
| 1986                                | 87,000                   | 1,876,000                | 4,772,000         |
| Difference between<br>1984 and 1985 | +25,000                  | +154,000                 | -456,000          |
| % change (A)                        | + 51%                    | + 9.9%                   | -9.1%             |
| Difference between<br>1984 and 1986 | +38,000                  | +324,000                 | -261,000          |
| % change                            | +77.6%                   | +20.9%                   | -5.1%             |
| % of fare change on<br>1.8.84 (B)   | + 15%                    | +10%                     | +8%               |
| Fare elasticity: A + B              |                          |                          |                   |
| 1985                                | $51 \div 15 = +3.4^*$    | $9.9 \div 10 = +0.99^*$  | $-9.1 \div 8 = -$ |
| 1.14                                |                          |                          |                   |
| 1986                                | $77.6 \div 15 = +5.17^*$ | $20.9 \div 10 = +2.09^*$ | $-5.1 \div 8 = -$ |
| 2.9                                 |                          |                          |                   |

\* Inverse elasticity (positive figures)

The elasticity measurement due to fare changes in August 1984 gives inverse elasticity\* for the first and second class, (where fare increase and demand increases, because the fare increase was accompanied by an improved service, and so the rise did not effect demand in the usual manner) while third class service showed a significant or meaningful result with elasticities of  $-1.14$  and  $-2.9$  for 1985 and 1986 respectively.

There are two possibilities here to explain why demand diminished in third class. Firstly, maybe some travellers were willing to spend more in order to use the second or first class facilities. Secondly, some travellers had switched to another mode (or did not travel at all).

The above analysis thus shows that the previous MR data can yield only a slight clue to the fare elasticity of demand in MR operations. In default of a viable alternative, we shall, as mentioned earlier, be obliged to use the elasticity measured in *other* systems as a basis for our further work on MR.

### **5.12 Elasticities grouping**

In order to estimate elasticity for MR, data such as rate of occupancy, MR statistics on passengers, travellers' opinion and information from the survey of opinion from experienced personnel of MR, opinion of other researchers in Britain and the researcher's own judgement, will all be used in *adjusting* the elasticity range to be estimated from relevant research done on other railways – or bus and railway (wherever relevant).

Before the estimated values are given, we group these elasticities under three categories, namely time-period, journey purpose, and passenger personal factors.



### **5.12.1      *Time Period***

*Night services* (after 8pm). The train is about three quarters full or more in all directions, even the first class sleeping berth is about 80% to 90% utilised.

*Weekends*. From Thursday evening to Sunday late night have higher percentage of occupancy compared to weekdays.

*Year* – during the last three months of the year, especially from mid-November till end of the year, the train service is busier than in the other three quarters of the year. This is because of school holidays for the children and annual leave for working parents and also for the working single person. There are too, a few national holidays which fall during this period, eg. Christmas holiday, New Year holiday, Deepavali (Hindu's celebration) etc.

*Public holidays* – Hari Raya (Muslim Celebration day twice a year), Chinese New Year, a number of religious celebration days, National Day, King's Birthday – these are examples of public holidays which make immigrants (those originally from rural areas or from other states) pack their bags and pay a visit to their hometown.

### **5.12.2      *Journey purpose related to demand elasticity***

Non-business trips, such as shopping and leisure, are more flexible compared to visiting family/friends. It means that the location for shopping and leisure can be changed from the big towns to just nearby towns. In the case of journeys for leisure purposes, they could be stopped; for example, people might choose to stay at home to watch TV rather than go to a cinema or attend exhibitions etc. However, to visit families in other places is more or less obligatory: for example to celebrate Hari Raya, to



attend weddings or for the fruit seasons for the Malaysian, particularly Malay people. During these times the demand for transportation is less elastic. They are willing to pay more in order to be with their folks for family gatherings.

#### **5.12.3 *Passenger personal factors***

Travellers without private transport (car for example) exhibit a smaller demand elasticity compared to those who own a car, or motorcycle.

Medium income group (\$501 to \$1000 a month) show less demand elasticity because they normally do not own a car. Those who earn more than \$1000 not only can have cars but have the choice to travel by aeroplane. Income here is disposable household income per capita, because if they earn more than \$1000 but have a large household, the net income is still small. (Of course, the pilot survey does not and could not reveal individual disposable incomes).

Single people display less demand elasticity than married couples because it is easier for them (the singles) to travel back home to their family for their holidays.

The personal characteristic factors also depend on the journey purpose, as discussed in section 5.12.2.

#### **5.13 Elasticities estimation**

Although we have categorised four main types of elasticity with MR, for the object of fare determination and differentiation, only two groups are needed. We cannot differentiate fare according to journey purpose because most of the journeys are for visiting; yet there can occur price discrimination according to income, if only because income normally determines what type of class or what type of service is chosen.



The two categories into which we can group the elasticity as a starting point, are as follows:

1. Kind of service, and
2. Time-period.

It is very important to note that this is not a simple fare elasticity estimation because there are no fare changes yet involved at this stage.

Now, we are trying to obtain some estimated figures by taking into consideration the demand over a certain period according to service and time-period. Later in the thesis, these figures will be applied in an experimentation Section in order to show to MR what fare elasticity means, and how it could help them in fare re-structuring as well as in improving their revenue.

After careful examination of those data available, the range of elasticity chosen was  $-0.6$  to  $-1.5$ . The assumption here is, the higher the rate of occupancy, the less elastic demand is (the elasticity measurement is more towards zero) or vice versa.

Although there is no mathematically rigorous justification for the following classification and estimates, it is the 'best' estimate possible given constraints described in this study.

FIGURE 5.4

ELASTICITY ESTIMATE ACCORDING TO TIME (9 CATEGORIES)

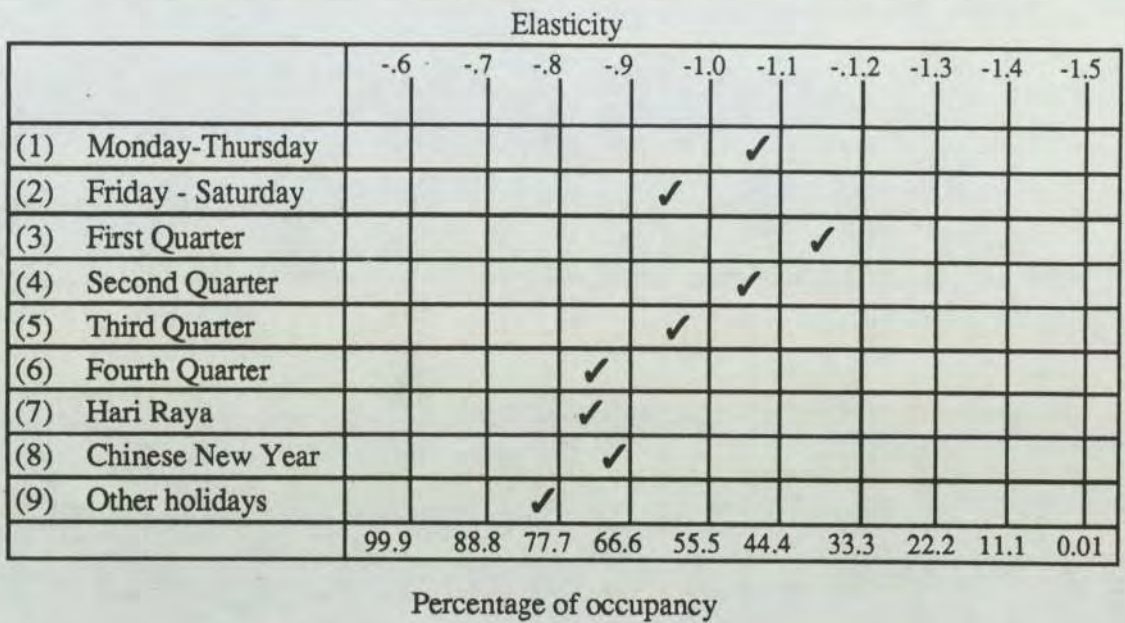
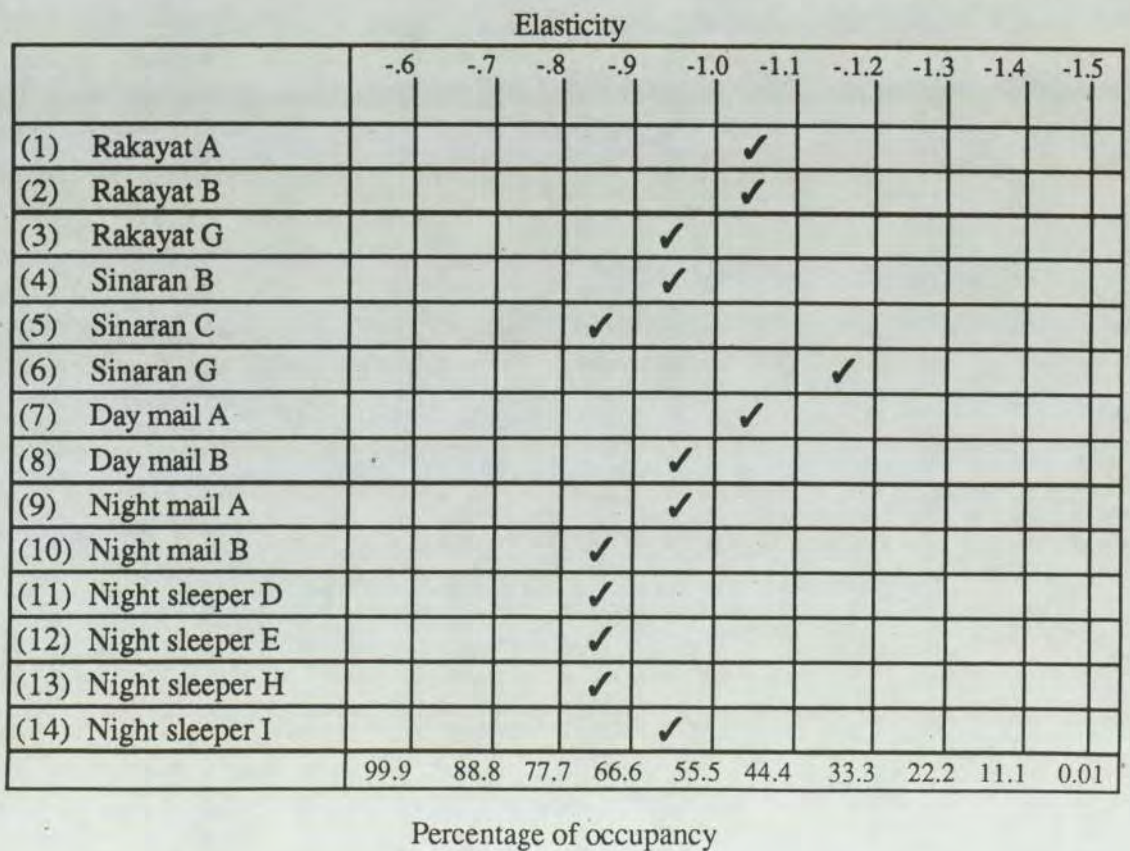


FIGURE 5.5

ELASTICITY ESTIMATE ACCORDING TO SERVICE (14 CATEGORIES)





Under the time-period group, the elasticity falls between  $-0.7$  to  $-1.2$ , with seven categories inbetween  $-0.8$  to  $-1.1$ . See FIGURE 5.4. Whereas under services and classes groups, the concentration is in the range of  $-0.8$  to  $-1.1$  (table 5.5). This rough estimation will guide us in discriminating the passenger fare according to time and type of service, and or class of service.

Following the summaries of FIGURES 5.2 and 5.3: these estimates pair with findings in point 5.12.2 and 5.12.3 in the earlier part of this chapter, and may be used to discriminate the fare.

**TABLE 5.2**  
**ELASTICITIES ESTIMATION ACCORDING TO TIME PERIOD**

| TIME PERIOD                                                          | ELASTICITIES |
|----------------------------------------------------------------------|--------------|
| Monday to Thursday<br>(2nd quarter (April-June))                     | -1.0 to -1.1 |
| Friday to Sunday<br>(3rd quarter (July-September))                   | - .9 to -1.0 |
| 1st quarter (January-March)                                          | -1.1 to -1.2 |
| Fourth quarter (October - December)<br>Hari Raya<br>Chinese New Year | -.8 to -.9   |
| Other holidays                                                       | -.7 to -.8   |
| Range                                                                | -0.7 to -1.2 |



**TABLE 5.3**  
**ELASTICITIES ESTIMATION ACCORDING TO SERVICE**

| TYPE OF SERVICE | ELASTICITIES |
|-----------------|--------------|
| Rakyat Express  | -0.9 to -1.1 |
| Day mail        |              |
| Sinaran Express | -0.8 to -1.2 |
| Night mail      | -0.8 to -1.0 |
| Night sleeper   |              |
| Range           | -0.8 to -1.2 |

#### **5.14 Fare determination**

Cost-plus-profit is one of the most widely used methods in fixing the price for goods or services. It means the producer will calculate their cost per unit of output (good or seat per kilometre). Then, a certain percent of mark-up will be added to the costs to get the price per unit. 'Mark-up' is normally based on the market situation. Unfortunately, the complexity of the costs structure in the railway operation has prevented them from using this simple margin principle. The current practice in many railways for commercially run services is to set competitive prices according to the market. After that, the prices are compared with costs, so to decide whether to accept traffic at the market rates or to adjust the market rates to the level of demand. Well established railways like BR as well as Canadian Pacific Railway (VIA) are using this pricing method.

In MR, a parallel price was set up according to the competitors' price in general; ie first class as aeroplane, second class as taxi and luxury coach, and third class as bus express

(for the long distance travel). In practice, MR fares are somewhat lower than its competitors, (see APPENDIX J for an example).

### **5.15 Conclusion**

There have been no fare changes in MR since August 1984, so it was decided for a start to use the elasticities estimates of other railways which have certain criteria that were thought to suit the MR market. Analysis of the reported experiences of other railways, discussion with experts, survey and other data collected in Malaysia has led the researcher to use a range of  $-0.6$  to  $-1.5$  (with  $\pm 0.2$ ) as a basis for more detailed elasticity estimates for MR.

Demand trends for the last few years, classified under times in a year, type and class of service as well as ticket types, were used to specify the smaller range. Analysis of the group of data gave some evidence that the ordinary ticket, especially third and second class, is relatively more popular than the express. This indicates that there is fare elasticity, as the cheaper ticket/service has higher demand than the expensive ticket/service.

It seems that some findings from the opinion survey analysed in Chapter Four and some points of the above conclusion contrast each other to a certain extent. One chosen practical answer to this conflict is to conduct an experimentation on fares and to measure elasticity by both RP and SP methods. After the experimentation and survey, one might be able, hopefully, to clarify whether MR is more elastic in fare *or* in quality of service; also one hopes to find out the actual fare elasticity range for its operation.

In the experimentation stage, there will be no precise elasticity measurement involved. The important emphasis is, when the price is increased, MR will get far less customers



than before if that segment is elastic and only small demand loss if this segment is inelastic. It is this appreciation of different outcomes from identical changes which opens up the possibility of a variety of fare changes each producing a better outcome.

## **CHAPTER SIX**

### **EXPERIMENTATION WITH FARE ELASTICITY OF DEMAND IN MR**

#### **Part One - Background**

##### **6.1 Introduction**

This Chapter is divided into three parts where the first will start with a brief description of the requirements of an experiment and the form it will take. Second part dealt with the two surveys as the pilot for the proposed experiment where one was tackled by using modified RP and another one applied the trade-off (SP) methods. It will try to show to MR management how to tackle the whole process of the experiment, which includes the timing, scheduling, monitoring, supervision, assistants, costs, data collection, opinion survey, staff training, data processing, reports and reviewing.

The fare elasticity ranges determined in the last part of Chapter Five will be used to construct in detail the fare increases set for different markets, according to service type and time of the year, peak and off-peak (or normal season). This will be followed by the simulation process to show the likely effect of fare movement on demand and revenue. A simple, BASIC programming will be used for this simulation.

The rest of the chapter draws up guidelines for MR to conduct the experiment by outlining it in detail and assessing the risks, using the simulation results together with the passenger response. Discussions on the benefits and drawbacks of the experiment and whether it is likely to be a valuable exercise will form the final part of the chapter and lead into the conclusion.



## 6.2 Reasons for experiment

The general discussion and analysis of railway fare elasticities in earlier sections of this thesis makes it clear that it is not possible to calculate precise elasticities as a basis for fare setting. There are multiple reasons for this, the wide range of market “segments” in terms of time of year, week, day, type of passenger and not least the dynamic nature of the elasticities themselves. In addition, if we look at MR itself, there is little historical evidence to help with this, and few past fare changes to build upon.

It is argued that, therefore, that the best way for MR to proceed is by a trial and error process, a process of experimentation with careful monitoring which will allow it to develop a detailed understanding of how to manipulate its fare structure.

MR could involve the whole system straight away with these fare changes *without* taking into consideration important factors such as the low, moderate and high demands of a segmented market and also the differing plans and opinions of the travelling public. This is thought to be a dangerous course of action to take, because such a uniform price movement runs considerable unquantifiable risks in terms of resource requirements (ie additional costs) and possible reductions in demand for rail travel (ie loss of revenue). By carefully selecting just a small number of services to be experimented with and thus limiting the scope of the experiment, risk is also reduced. It is also easier to monitor the whole procedure, review it in detail, and (if necessary), adapt, curtail or withdraw easily and promptly.

Later, if the experiment proves to give better revenue or improves MR’s financial position, then the entire railway system may become involved. If this approach does not produce significant revenue improvements MR will need to try some other approaches (such as were mentioned in Chapter One the Introduction). The main contention is that MR simply



must move away from their present standpoint – they cannot just continue to stick to an attitude of ‘come what may’ under all circumstances. A change in fare policy is both possible and overdue.

### 6.3 Strategies

There are two possible strategies which MR can try to look into:-

First, occasions when demand is less elastic or *inelastic* - for example, visiting during Hari Raya – the seats are full in second and third class of all types of services; in fact there is over-demand. This is where the fare can be increased by a few percent and if there are empty seats in first class, MR should try to fill them by offering certain discounts to second and third class ticket holders who move up to first class. Another option is to offer a standby reduced fare, where if there are empty seats available after the ticket counter was closed, tickets may be sold at a lower fare than normal.

The second strategy is for when demand is highly *elastic*, during the week when first class are almost empty and second class have been occupied less than half. This is where third class can go to second or first class by paying a small amount of supplementary fare. At the same time, MR can offer special reductions in the second and first class accommodation to senior citizens or unemployed travellers who can make journeys without working time restrictions - for example, on the off-peak morning express train or day mail train. The reduced fare for third class will not be involved here in this study because at present there are few offers of fare reduction (eg., for senior citizens and students) but they are not popular.

Through these two strategies we can look into both directions of fare movement, upward and downward. In the normal situation, when price rises, demand is less than before, and



when price falls, the demand will rise. Here we have to find out the reduction in passengers due to a fare increase, pitching the latter so as not to damage business, because what one wants is to increase revenue without increasing costs. After all the ultimate aim is for MR to operate at a profit.

#### **6.4 Monitoring requirements**

Such a project, efficiently managed, requires monitoring; and this would largely be the responsibility of MR personnel at several levels of the management structure either together with the researcher as consultant, or even independently. The form which it should take may vary according to the stage of the project reached at that time. Minimally, it may involve the setting of objectives at the political, financial, managerial and operational levels, against which progress may be plotted, and future guidelines developed.

The implementation network may be utilised for the scheduling and co-ordination of various complementary initiatives such as training, tickets and leaflet printing, survey, analysis, publicity etc, and should contain feedback loops.

Since the fare experiment is totally a new idea for MR's travellers, it needs to be well publicised in the mass media. The main aim is to inform the public about the fare changes, offers and discounts available, which at the same time can be a kind of promotion for MR too. Another reason is to make the travellers or potential travellers aware that MR is collecting some information through surveys.

Costs should be targetted as estimates and recorded as out-turns. Especially, the short term results of fare changes in terms of revenue contributions should be set against those anticipated from each service based upon the elasticity estimates arising from the actual travel statistics and surveys. These results, although probably differing in the long-run



from the short, will be most useful in obtaining advance indication of overall viability of the project. An inexpensive minor adjustment may then be sanctioned in view of its ultimate effect on revenue, or in cases of serious divergence, an alternative plan may be adopted.

Monitoring on an on-going basis should continue in order to provide MR with updated market research findings and to constantly recheck the databases from which elasticity estimates derive, and where changes both gradual and sudden may occur. Once the new framework of fare and services is in place and making its contribution, further changes may be undertaken in order to optimise financial performance, and to maintain competitiveness with other modes of transport. Once decision-takers have acquired a taste for customer-market based fares and services, monitoring will become increasingly utilised by MR management at various levels.

There are ten types of service categorised according to their seat accommodation. For the purposes of the experiments, these comprise of four groups, within each of which there exists an individual elasticity range and a different percentage of fare increase. The experiment will take about 12 months, during which data on passengers – numbers, distance (Km) and revenue will be collected from the ticket sales record (this has been MR practice for quite some time already). During the same period, three opinion surveys on the travelling public will be carried out with co-supervision from both MR personnel and survey assistants drawn from students of The National University of Malaysia.

The one-year period experiment is divided into three phases (as shown in FIGURE 6.1), where each of them will start with an opinion survey on fare proposals and travel plans.

Periodical reports and reviews of every phase are expected to be ready within three months after completion – the first phase result before March 1992, second phase result before



June 1992 and third phase result before October 1992. The decision whether MR will implement this exercise in full (involve the whole system), hopefully can be made before the end of the 12 months of experiment based on these periodical findings and reviews.

Most likely MONANOVA, TOFPTA and SPSS are the two software packages which will be used to process the opinion survey. Each phase of experiment will come out with two types of elasticity measurement – RP and SP. A simple BASIC program, as shown in the Appendix I, for demand and revenue simulation, is going to be used to measure the actual MR fare elasticity. Later these new figures will be confirmed by the initial estimates (before the experiments) to see the actual benefit and risks. Results can be used to review this experimental exercise to set the new fares, now designed to yield a better return to MR.

The one year period is chosen because it is thought to be long enough to see a short-term effect on the fare changes in terms of consumers' response and MR familiarity with the exercise. The total costs are expected to be around M\$30,000, financed in part from The National University (researchers' employer) research allocation, with the balance from the R&D division of MR.

## **6.5 Simulation and risk management**

In order to show the likely result of the fares chosen to be used in the experiment, a simple computer programme will simulate the fare, utilising the proposed elasticity ranges. It is important to note that the original demand which known as (Q1) here is based on the actual seat occupancy from the ticket sales data of 1987. Most probably these numbers (demand) can be easily replaced by up-to-date statistics available immediately before the experiment, eg. 1989. If, however, there are no significant differences in the number of passengers

between 1987 and 1989, MR can straight away chose any combination of fare increases shown in TABLE 6.4.

MR demand forecast from the Report on Strategy (MR 1986) is insufficient to be used here because it is calculated as an aggregate (total demand for all types of service) and is not detailed according to the type of service available.

For the purpose of measuring the benefit and risks of the fare experiment, the following discussion will focus on time period and fares involved, the simulation process and its result.

**6.5.1 Times**

The service times at which we are interested to measure the elasticities are grouped as in the following table. The elasticity given in the right side of the table is the estimation which was obtained from chapter 5 – section 5.11. This table provides a stepping-stone to those that follow.



**TABLE 6.1**  
**TIME AND ELASTICITY ESTIMATES**

| TIME                 | ELASTICITY ESTIMATE |
|----------------------|---------------------|
| 1. Monday - Thursday | -1.1                |
| 2. Friday - Sunday   | -1.0                |
| 3. Hari Raya Puasa   | -0.9                |
| 4. Chinese New Year  | -0.9                |
| 5. Fourth quarter    | -0.9                |

The times selected to be involved in the simulation are those sequenced 1 to 4 (Table 6.1). The fourth quarter (number 5) is eliminated in order to avoid more complexity, because Monday-Thursday and Friday-Sunday occur in the fourth quarter. The two festival times of Hari Raya Puasa and Chinese New Year have their own calendar which varies from year to year, so they are grouped together as HRP and CNY. Therefore the time factor falls into just three groups: Monday to Thursday, Friday to Sunday, and HRP and CNY.

#### 6.5.2 Fare changes

In order to gauge the amount of fare changes, refer back to chapter five, section 5.13 because this section deals with increasing fares according to their elasticity range. Table 6.2 shows the ticket type and suggested percentage fare increase according to the elasticity range – the smaller the elasticity range, the higher the percentage fare increase range, and vice versa.

TABLE 6.2

## ELASTICITY RANGES ACCORDING TO TICKET TYPE AND FARE CHANGES

| Service (Ticket Type)*<br>increase                                                                                                       | Elasticity Range | % of fare    |
|------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------|
| <b>Group 1</b><br>1. Sinaran (C)* – S(C)<br>2. Night Sleeper (D) – NS(D)<br>3. Night Sleeper (E) – NS(E)<br>4. Night Sleeper (H) – NS(H) | -0.81 to -0.90   | 5%, 10%, 15% |
| <b>Group 2</b><br>5. Rakyat (G) – R(G)<br>6. Sinaran (B) – S(B)<br>7. Night Sleeper (I) – NS(I)                                          | -0.91 to -1.0    | 5%, 8%, 10%  |
| <b>Group 3</b><br>8. Rakyat (A) – R (A)<br>9. Rakyat (B) – R (B)                                                                         | -1.01 to -1.10   | 3%, 5%, 8%   |
| <b>Group 4</b><br>10. Sinaran (G) – S (G)                                                                                                | -1.11 to -1.20   | 3%, 5%, 7%   |

\* Indication for the ticket type - see pp 129, Data Analysis (chapter 4)



The last increments (in 1984) were across-the-board for each class: 8% for third class, 10% for second class, and 15% for first class. The varying ranges of fare increments suggested here reflect the differing demand elasticities affecting the several groups within each class. The range extends from 3% up to 15%, the inelastic groups 1 and 2 ( $\leq -1.0$ ) having larger ranges of percentage fare increases, and the elastic groups 3 and 4 ( $> -1.0$ ) having lower percentage increases. It seems reasonable to increase in the above percentages for 1990 in view of the fact that after six years (August 1984 to August 1990) the inflation rate and MR costs have both increased.

The present fare was set above 1984's costs and within the range (floor and ceiling rate) meeting government requirements. Due to confidentiality, MR is reluctant to reveal to the public what are their costs and what are the floor and ceiling rates allowed by government. In comparison to other types of public transport in terms of fare (where third class train is equivalent to express bus, second class equals taxi and first class equals aeroplane), it is considered that trains stay cheaper than the rest. Even the recommended increase for August 1990 will still make train fares less than the present fares of other modes. Fares and comparative fares and journey times for the major towns are displayed in Appendix J.

Supplementary payments for the extra facilities are the same as before. In the experimental fare a blanket rate of 10% on what the travellers already paid is charged for those would like to transfer from third to second class or from second to first class whenever applicable. For further discussion the basic fare will be known as A rate, and supplementary or extra as B rate, while the total fare will be called the C rate. Therefore the 10% payment to move on to the higher classes is on A rate. The announcement about B-rate seats available for the second and third class will be made after the train leaves the first station. By then the ticket staff will know how many seats are available after the last ticket has been sold at the station counter. {Notes: According to MR Planning, by 1990 the on-line ticketing/boarding system will be in full use; at the moment it is on a trial



basis}. Those passengers who want to move to a better class will therefore be dealing with ticketing staff during ticket checks on board train. There is no intention in this proposed experiment to forecast the demand and revenue which may accrue from the movement of passengers from lower class to the better class on board: it will be considered as an extra collection.

Although the elasticity ranges which were set according to the time of year vary between  $-0.9$  and  $-1.1$ , and may be considered on the border line between inelastic and elastic (less than  $-1.0$  and bigger than  $-1.0$  by  $-0.1$ ) the service types/ticket types make allowance for bigger ranges. Table 6.2 shows the services chosen for the experiment are divided into four groups, 1 to 4 and the elasticity ranges are shown as from  $-0.81$  to  $-1.20$  by the same Table.

Since the range of every group is too narrow, it will not give a significant meaning in the simulation result. Therefore it is better to widen the gap by taking the middle range as  $-0.8$  for group 1,  $-0.9$  for group 2,  $-1.0$  for group 3 and  $-1.1$  for group 4. Next, a figure of  $-0.4$  will be added or subtracted from those middle ranges, of which the outcome is as shown in TABLE 6.3. Figure  $-0.4$  is chosen because the small value will not produce significant results for revenue comparison except for group 1 - Friday to Sunday and HRP and CNY (see table 6.4). Another reason is to allow for a substituted range of error in estimation.

The travel time and elasticity estimates in TABLE 6.1 will be used to determine the percentages of fare increase. Whenever demand is elastic, the percentage of fare increment is higher; and whenever it is less elastic, lower. The final adjustment figures intended for input in the simulation are shown in TABLE 6.3.



**TABLE 6.3**  
**ELASTICITY RANGES AND PERCENTAGE OF FARE CHANGES ACCORDING TO**  
**TICKET TYPE AND TRAVEL TIMES**

| <b>Times<br/>Ticket Type</b>                             | <b>Monday Thursday</b> | <b>Friday - Sunday</b> | <b>HRP &amp; CNY</b> |
|----------------------------------------------------------|------------------------|------------------------|----------------------|
| <b>Group 1</b><br>Elasticities range<br>-0.4, -0.8, -1.2 | 5%                     | 10%                    | 15%                  |
| <b>Group 2</b><br>Elasticities range<br>-0.5, -0.9, -1.3 | 5%                     | 8%                     | 10%                  |
| <b>Group 3</b><br>Elasticities range<br>-0.6, -1.0, -1.4 | 3%                     | 5%                     | 8%                   |
| <b>Group 4</b><br>Elasticities range<br>-0.7, -1.1, -1.5 | 3%                     | 5%                     | 7%                   |

NOTE: Every elasticity figure is simulated for 3 different fare increases. This important table demonstrates the model for experimentation in full.

### 6.5.3 Simulation process

The suggested elasticity value used in this proposal was chosen after a thorough consideration of a number of factors. It included the rate of seat occupancy, opinions of travellers from the survey, opinions of MR personnel, of a British researcher who is familiar with Malaysia transportation and the researcher's own judgement. However, the

customer has the final decision whether they are going to travel by train or not. Only at the end of the experimentation period can the actual elasticity value be revealed.

Before the experiment, it is important to know the risk which MR might take if they carry out the experiment. In this case the risk is on the revenue which results from the fare increases. In section five of this chapter we have decided the time and type of ticket which we are going to include in the experiment. We intend to use mid-point elasticity formula in order to forecast the demand and revenue. The equation is:

$$E = \left( \frac{p_2 - p_1}{p_2 + p_1} \right) \left( \frac{x_2 + x_1}{x_2 - x_1} \right)$$

Where:  $p_1$  is the present fare

$p_2$  is the new fare

$x_1$  is the present demand

$x_2$  is the forecast demand

$E$  is the fare elasticity

Details of the programming and simulation process are shown in Appendix I. TABLE 6.4 exhibits the result from the simulation.

#### **6.5.4 Simulation result**

From the wealth of numerical calculation comprising table 6.4, it can be seen that where the market demand is elastic in relation to fares changed from an existing level, revenue tend to decrease; and where it is inelastic, revenue tend to increase.



**TABLE 6.4**  
**SIMULATION RESULT OF MR PRESENT AND FORECAST REVENUES USING**  
**DIFFERENT ELASTICITY VALUES**

| Type of Service           | Present Revenue | $E_A$<br>-0.4  | %<br>Inc. | $E_I$<br>-0.8  | %<br>Inc. | $E_B$<br>-1.2  | %<br>Dec. |
|---------------------------|-----------------|----------------|-----------|----------------|-----------|----------------|-----------|
| <i>Group 1</i>            |                 |                |           |                |           |                |           |
| <i>(1) Monday-Tuesday</i> |                 |                |           |                |           |                |           |
| S (C)                     | 25,200          | 25,949         | 3         | 25,447         | 1         | 24,955         | -1        |
| NS (D)                    | 30,140          | 30,860         | 2.4       | 30,378         | 0.8       | 29,904         | -0.8      |
| NS (E)                    | 41,160          | 42,077         | 2.2       | 41,464         | 0.7       | 40,859         | -0.7      |
| NS (H)                    | 5,166           | 5,295          | 2.5       | 5,209          | 0.8       | 5,124          | -0.8      |
| <b>Total</b>              | <b>101,666</b>  | <b>104,181</b> |           | <b>102,498</b> |           | <b>100,842</b> |           |
| <i>(2) Friday-Sunday</i>  |                 |                |           |                |           |                |           |
| S (C)                     | 23,800          | 25,201         | 5.9       | 24,259         | 1.9       | 23,350         | -1.9      |
| NS (D)                    | 23,838          | 24,969         | 4.7       | 24,209         | 1.6       | 23,472         | -1.5      |
| NS (E)                    | 29,400          | 30,701         | 4.4       | 29,828         | 1.5       | 29,978         | -1.4      |
| NS (H)                    | 5,740           | 6,023          | 4.9       | 5,833          | 1.6       | 5,648          | -1.6      |
| <b>Total</b>              | <b>82,778</b>   | <b>86,894</b>  |           | <b>84,129</b>  |           | <b>82,448</b>  |           |
| <i>(3) HRP and CNY</i>    |                 |                |           |                |           |                |           |
| S (C)                     | 30,080          | 41,259         | 8         | 39,113         | 3         | 37,073         | -3        |
| NS (D)                    | 38,086          | 40,777         | 7         | 38,964         | 2         | 37,227         | -2        |
| NS (E)                    | 37,926          | 40,427         | 7         | 38,743         | 2         | 37,126         | -2        |
| NS (H)                    | 7,462           | 8,011          | 7.4       | 7,641          | 2.4       | 7,287          | -2.3      |
| <b>Total</b>              | <b>113,554</b>  | <b>130,474</b> |           | <b>124,461</b> |           | <b>118,713</b> |           |

**NB:**  $E_I$  is the initial elasticity estimates

$E_A$  is the error estimates for less elastic than initial

$E_B$  is the error estimates for more elastic than initial

TABLE 6.4 (CONTD.)

| Type of Service              | Present Revenue | E <sub>A</sub><br>-0.5 | %<br>Inc. | E <sub>I</sub><br>-0.9 | %<br>Inc. | E <sub>B</sub><br>-1.3 | %<br>Dec. |
|------------------------------|-----------------|------------------------|-----------|------------------------|-----------|------------------------|-----------|
| <b>Group 2</b>               |                 |                        |           |                        |           |                        |           |
| <i>(1) Monday - Thursday</i> |                 |                        |           |                        |           |                        |           |
| R (G)                        | 6,660           | 6,763                  | 2.5       | 6,632                  | 0.5       | 6,504                  | -1.5      |
| S (B)                        | 10,750          | 11,068                 | 3         | 10,813                 | 0.6       | 10,564                 | -1.7      |
| NS (I)                       | 5,392           | 5,487                  | 1.8       | 4,066                  | 0.5       | 3,978                  | -1.6      |
| <b>Total</b>                 | <b>22,742</b>   | <b>23,318</b>          |           | <b>22,856</b>          |           | <b>22,404</b>          |           |
| <i>(2) Friday - Sunday</i>   |                 |                        |           |                        |           |                        |           |
| R (G)                        | 7,975           | 8,288                  | 3.9       | 8,037                  | 0.8       | 7,793                  | -2.3      |
| S (B)                        | 12,000          | 12,471                 | 3.9       | 12,093                 | 0.8       | 11,726                 | -2.3      |
| NS (I)                       | 4,044           | 4,156                  | 2.8       | 4,066                  | 0.5       | 3,978                  | -1.6      |
| <b>Total</b>                 | <b>24,019</b>   | <b>24,915</b>          |           | <b>24,196</b>          |           | <b>23,497</b>          |           |
| <i>(3) HRP and CNY</i>       |                 |                        |           |                        |           |                        |           |
| R (G)                        | 11,556          | 12,114                 | 4.9       | 11,661                 | 1.0       | 11,224                 | -2.8      |
| S (B)                        | 17,500          | 18,355                 | 4.9       | 17,668                 | 1.0       | 17,006                 | -2.8      |
| NS (I)                       | 4,044           | 4,184                  | 3.5       | 4,072                  | 0.7       | 3,962                  | -2        |
| <b>Total</b>                 | <b>33,100</b>   | <b>34,653</b>          |           | <b>33,401</b>          |           | <b>32,192</b>          |           |



TABLE 6.4 (CONTD.)

| $E_A$<br>-0.6                |        |        |     | $E_I$<br>-1.0 |   | $E_B$<br>-1.4 |      |
|------------------------------|--------|--------|-----|---------------|---|---------------|------|
| <i>Group 3</i>               |        |        |     |               |   |               |      |
| <i>(1) Monday - Thursday</i> |        |        |     |               |   |               |      |
| R (A)                        | 23,630 | 23,906 | 1.2 | 23,630        | 0 | 23,358        | -1.2 |
| R (B)                        | 5,750  | 5,818  | 1.2 | 5,750         | 0 | 5,682         | -1.2 |
| <b>Total</b>                 | 29,380 | 29,724 |     | 29,380        |   | 29,040        |      |
| <i>(2) Friday - Sunday</i>   |        |        |     |               |   |               |      |
| R (A)                        | 12,920 | 13,175 | 2   | 12,920        | 0 | 12,670        | -1.9 |
| R (B)                        | 3,300  | 3,365  | 2   | 3,300         | 0 | 3,236         | -1.9 |
| <b>Total</b>                 | 16,220 | 15,540 |     | 16,220        |   | 15,906        |      |
| <i>(3) HRP and CNY</i>       |        |        |     |               |   |               |      |
| R (A)                        | 23,630 | 24,571 | 4   | 23,630        | 0 | 22,717        | -3.9 |
| R (B)                        | 5,750  | 6,235  | 8.4 | 5,750         | 0 | 5,279         | -8.2 |
| <b>Total</b>                 | 29,380 | 30,806 |     | 29,380        |   | 27,996        |      |

| TABLE 6.4 (CONTD.) |                          |                        |           |                        |           |                        |           |
|--------------------|--------------------------|------------------------|-----------|------------------------|-----------|------------------------|-----------|
| Type of Service    | Present Revenue          | E <sub>A</sub><br>-0.7 | %<br>Inc. | E <sub>I</sub><br>-1.1 | %<br>Inc. | E <sub>B</sub><br>-1.5 | %<br>Dec. |
| <i>Group 4</i>     |                          |                        |           |                        |           |                        |           |
| (1)                | <i>Monday - Thursday</i> |                        |           |                        |           |                        |           |
| S (G)              | 10,800                   | 10,895                 | 0.9       | 10,69                  | -0.3      | 10,643                 | -1.5      |
| (2)                | <i>Friday - Sunday</i>   |                        |           |                        |           |                        |           |
| S (G)              | 7,020                    | 7,124                  | 1.5       | 6,986                  | -0.5      | 6,851                  | -2.4      |
| (3)                | <i>HRP and CNY</i>       |                        |           |                        |           |                        |           |
| S (G)              | 9,720                    | 9,920                  | 2.1       | 9.654                  | -0.7      | 9.395                  | -3.3      |

In order to have clear picture for further discusion on the likely result from the experiment, Table 6.4 will be summarised as shown in table 6.5 and its following notes and calculation.



**TABLE 6.5**  
**SUMMARY ANALYSIS OF EXPECTED TOTAL REVENUE FROM THE FARE**  
**EXPERIMENT**

| Times        | Present Rev.<br>(\$) | Revenue at E <sub>A</sub><br>(\$) | Revenue at E <sub>I</sub><br>(\$) | Revenue at E <sub>B</sub><br>(\$) |
|--------------|----------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Mon-Thur     | 164,588              | 168,118                           | 165,503                           | 162,929                           |
| Fri-Sun      | 130,037              | 135,473                           | 131,531                           | 128,702                           |
| HRP and CNY* | 185,754              | 205,858                           | 196,896                           | 188,296                           |

- \* (a) For HRP and CNY is the total for the whole period involved, roughly about two weeks.  
(b) For Monday-Thursday and Friday-Sunday the total is per week.  
(c) There are 365 days a year of which 15 days (2 weeks) are already allocated for HRP and CNY. The balance of 350 days are equal to 50 weeks.  
(d) Therefore the figures for Monday-Thursday and Friday-Sunday need to be multiplied by 50 weeks.  
(e) There are two services operating everyday (ie. total of four flows). The revenue was calculated based on two flows only (average).

Calculation:

| Times             | Present Rev.<br>(\$) | Revenue at E <sub>A</sub><br>(\$) | Revenue at E <sub>I</sub><br>(\$) | Revenue at E <sub>B</sub><br>(\$) |
|-------------------|----------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| Mon-Sun<br>(week) | 294,625<br>x 50      | 303,591<br>x 50                   | 297,034<br>x 50                   | 291,631<br>x 50                   |
|                   | 14,731,250           | 15,179,550                        | 14,851,700                        | 14,581,550                        |
| HRP and CNY       | 185,754+             | 205,858+                          | 196,896+                          | 188,296+                          |
| (services)        | 14,917,004<br>x 2    | 15,385,403<br>x 2                 | 15,048,596<br>x 2                 | 14,769,846<br>x 2                 |
|                   | \$29,834,008         | \$30,770,806                      | \$30,097,192                      | \$29,539,692                      |
| % expected change | -                    | 3.14%<br>(Increase)               | 0.9%<br>(Increase)                | 0.1%<br>(Decrease)                |

Revenues estimated over approximately half of the MR passenger service by summing those of the three time-factor groupings in the elasticity simulations (cf: table 6.5) came very close to the actual present revenue calculated for the same time groups – \$30,097,192 (at initial elasticity estimate) compared with \$29,834,008. If the actual elasticity from the experiment appears to be less elastic ( $E_A$ ) the revenue will be \$30,770,806 (3.14% higher), and if the reverse situation happens, (ie at  $E_B$ ) the revenue will drop to \$29,539,692 (0.1% lower) than the present. Clearly, gains in revenue are **not** outweighed by losses as a result of the new method. The cost of the experiment, although negligible in terms of total revenue, will not deepen losses, but be covered by gains.

The elasticity estimates are given in a wide range, so that MR can decide for themselves whether it is worthwhile to increase fares according to demand elasticity. Although they can probably never achieve any completely accurate value of elasticity it seems beyond doubt that MR have some of their market segments elastic and some not. After the first four month experiment, data from their ticket sales and data from the survey will help to measure elasticity, resulting in more significant and useful estimates. These could be used to determine the desired percentages of fare increases, which in turn will facilitate better demand and revenue forecasting.

The range of absolute figures in price increase for every group are:

Group 1 – \$1.10 to \$7.20

Group 2 – \$1.25 to \$5.50

Group 3 – \$0.50 to \$2.00

Group 4 – \$1.60 to \$3.80



The ranges are calculated for the longest distance either from Kuala Lumpur to Butterworth or Kuala Lumpur to Singapore. The shorter distance may cost the travellers a small amount extra beyond what they are paying at present. Therefore the suggested figures of increment are considered reasonable and acceptable, especially if one considers the increases in other public transport fares, the rise in petrol prices, and the incredible increase in car prices over the last five years in Malaysia.

Altogether, it is emphasised that this fare increase exercise should not be confused by introducing service improvements; in reality, with a period covering one year of experimentation, the service will improve somehow or other. This will effect the demand indirectly; thus the increase in fare may probably enable MR to keep their market share as before, if not to have a bigger share. Hence, there exists a possibility of actually getting a real elasticity around the ranges found in this study. The only risk which may occur from this experiment is when, if it happens that the estimates of elasticities are widely in error, the demand is even more elastic ( $E_B$ ) than the initial estimate. In this case the only thing MR will gain, is experience; and the value of this cannot be quantified.

However, one has to remember that risk-taking is an integral part of business activity. If MR fails in its first attempt at this experiment, the result may yet be a better set of elasticity estimates suited to their services – and these could be used in another experiment. In general, to determine the fare according to demand elasticity is better than a blanket increase. Careful market research, in this case through the opinion survey of travellers, will help MR to improve the estimation of elasticity as well as to determine their fares using this concept.



## **Part Two - Analysis of 1990 Surveys**

Data collection surveys on fare experimentation undertaken during 1990, were divided into two parts, the first concerned with RP methods, the second in the form of an experiment in the application of SP methods. The latter allowed respondents to exercise a trade-off between three pre-defined attributes of a train/service. There now follows discussion of the detail involved in each type of survey.

The original plan was to conduct the survey in February 1990 using only SP methods. However, unfortunately there were a number of problems with the questionnaire design. In particular, the questionnaire did not include 'level elements' (good, moderate, bad) for the train attributes (fare, comfort, travelling time).

Also, the particular software to analyse the data to obtain individual elasticity estimates was not available in Malaysia. However, because of the smallness of the sample we were able to use a simple BASIC program to analyse the data derived from Question 8 (see Appendix K). This indicated that there was no evidence to suggest that the original estimates of elasticities needed to be changed.

### **6.6 Revealed Preference Methods and Modified Stated Preference Methods:**

#### **6.6.1 Sample**

This RP survey was carried out over three days between 8th - 10th February 1990. The samples were chosen randomly on trains running from Kuala Lumpur to Singapore, involved mail train, night train, express train and ordinary train and the sample was stratified according to class of service. It was initially fixed according to the following ratio, 20% first class, 40% second class and another 40% third class. Due to a problem of



getting co-operation from first class passengers the final ratio was as follow: 16% first class, 44% second class and 40% third class. The researcher and three interviewers were involved.

MR gave our team full support by supplying free travel passes for any train for that period between Kuala Lumpur and Singapore station. We were also offered free catering facilities on board and a proper room as meeting point at Johore Bharu Station near Singapore before the causeway. This proved to be very useful because researcher and interviewers then had the opportunity to discuss any problem that had occurred during that period and also the researcher had full control of the survey activity. Since this is the second survey for the researcher on MR service, MR staff at the Headquarters, at the station and on board were ready to give whatever assistance was needed in their area and under their authority.

**6.6.2 Questionnaire**

The questionnaire consisted of three parts:- section one required the respondents to give their socioeconomic background information (Q1 to Q6); section two asked the respondents' opinion on the fare and service of MR (Q7 to Q10); and section three asked respondents to rank twelve types of train and class combination as shown in Section 3 of APPENDIX K. They were given twelve cards which were divided into three groups according to class of train.

|              |                                        |          |
|--------------|----------------------------------------|----------|
| First Class  | - 4 cards, identified as A, B, C, D    | (White)  |
| Second Class | - 5 cards, identified as E, F, G, H, I | (Yellow) |
| Third Class  | - 3 cards, identified as J, K, L       | (Blue)   |

Each card contained the fare value (present and future) from Kuala Lumpur to Singapore; this pair of stations were chosen as the sample frame for this survey. Another two items

of information were travelling time (present and future), and comfort, which was represented by class (1, 2 or 3), type of train (night sleeper, night mail, express and ordinary service), sleeping accommodation and seat availability, (second and first class seats are guaranteed but third class depends on "first come first served").

#### **6.6.3 Interview**

Interviews were held face-to-face and the time spent on each one was about 15 minutes for the first and second section while the third section required half-an-hour because the interviewers had to ensure that the respondents understood what the question tried to find out:- they had to compare all the three factors involved, which were fare, travelling time and comfort. Many of them rearranged the cards a few times until they were really satisfied with their ranking.

#### **6.6.4 Analysis and Interpretation**

Data obtained from the questionnaire were analysed using SPSS package. The results are as follow:

In train attributes, respondents from four categories of train - mail, night sleeper, express and ordinary train were asked as to their preference using train on three factors - i.e. comfort, journey time and fare. The result is as shown in the table below:



**Rankings of preference in train journey:.**

|                                     | %                     |
|-------------------------------------|-----------------------|
| Comfort and journey time priority   | 42.0                  |
| Fare priority                       | 30.0                  |
| Comfort and journey time equal fare | 28.0                  |
| <b>Total</b>                        | <u>100.0%</u><br>==== |

In the above table the respondents placed the importance of comfort and shorter journey time as the highest priority, which is 42% . Only 30% chose fare as the highest priority among the factors while 28% put the same weight between comfort and journey time with fare. This indicates that express train managed to attract a bigger market compared to other type of services because it is more comfortable with shorter journey time although its fare is more expensive.

In terms of the transport type they would prefer if they could afford it, more than 50% chose train, followed by 29% aeroplane, 10% car and only 5% bus. It means train is still the most popular choice.

Since the sampling was only from rail travellers this inevitably biased the results towards rail travel as in most popular forms of transport. This is one of the reasons why in the actual experiments we recommend that a sample should include respondents using other forms of transport. Thus interviews should be undertaken at bus terminals and airports or in the home.

**Preferred mode of transport:**

|              | %               |
|--------------|-----------------|
| Bus          | 5.0             |
| Train        | 54.0            |
| Car          | 10.0            |
| Aeroplane    | 29.0            |
| Others       | <u>30.0</u>     |
| <b>Total</b> | 100.0%<br>===== |

This analysis implied that, if trains can improve their service quality with a 10% increase in fare, they probably can capture a bigger share of the transport market. This was shown by the answers on the respondents' opinion on fare increase and the opinion on whether MR should continue the service in the two tables below:

**Willingness to use train if fares are increased:**

|                                           | %               |
|-------------------------------------------|-----------------|
| Yes, if only 10% increase                 | 69.0            |
| Yes, if 15% increase                      | 19.0            |
| Will give up train if fares are increased | <u>12.0</u>     |
| <b>Total</b>                              | 100.0%<br>===== |

**Opinion on MR service whether to continue or to stop:**

|                                                              | %               |
|--------------------------------------------------------------|-----------------|
| Stop unprofitable service                                    | 1.0             |
| Continue as it is                                            | 8.0             |
| Improve the service without fare increase                    | 63.0            |
| Improve the service substantially, followed by fare increase | <u>28.0</u>     |
| <b>Total</b>                                                 | 100.0%<br>===== |



Respondents in the third and second class were asked if they would like to move up to the better class with better facilities and were willing to pay extra while they were already on board the train - i.e 10% extra to move up one class, or 20% extra to move up two classes. This is well below the existing differentials (see pages 53 & 197). 16% of them did not answer this question because they were already in the first class.

|                        | %           |
|------------------------|-------------|
| No move (first class)  | 16.0        |
| Do not wish to move-up | 26.0        |
| Yes, to second class   | 28.0        |
| Yes, to first class    | <u>30.0</u> |
| <b>Total</b>           | 100.0%      |
|                        | =====       |

There exist two factors which have the same position in both September 1987 survey and in February 1990 survey. Firstly, the type of transport owned by respondents:- the biggest number of train travellers were those without their own transport, followed by those who have a car. While regarding income, the highest percentage of travellers were those with more than \$1000 monthly gross income - 21% in 1987 and 41% from that group (this time the net income) in 1990. The fact that 27% did not answer the question in 1987 survey may affect this comparison since it is unclear which categories they may belong to. This may mean that the larger % above \$1000 is not significant.

It is important to note that wage inflation has very little influence on the value of these figures. This is because there has been no national wage increase within the last two years with the exception of a 2% increase in A group category (above \$1,000). Normally the inflation rate is not an important factor in wage increases. A more important factor is the

political situation with, for example, a small percentage increase in wages usually being announced a few months before the general election (ie once every four years).

Study the following tables which showed a comparison between the two surveys in transport ownership and income.

**Transport Owned**

|              | % in 1987 survey | % in 1990 survey |
|--------------|------------------|------------------|
| No transport | 38.6             | 42.0             |
| Car          | 30.0             | 31.0             |
| Van          | 0.7              | 1.0              |
| Motorcycle   | 20.5             | 23.0             |
| Lorry        | 2.5              | -                |
| Others       | -                | 3.0              |
| No answer    | 7.7              | -                |
| <b>Total</b> | 100.0%           | 100.0%           |

Another interesting point in the above table is percentage amount for every type of transport or no transport is almost the same in both surveys.



**Income**

|                                    | % in 1987 survey | % in 1990 survey |
|------------------------------------|------------------|------------------|
| Less than \$200                    | 2.2              | 4.0              |
| \$201 - \$500                      | 20.3             | 16.0             |
| \$501 - \$750                      | 18.1             | 14.0             |
| \$750 - \$1000                     | 11.1             | 12.0             |
| More than \$1001                   | 21.0             | 41.0             |
| No income (house<br>wife, student) | -                | 13.0             |
| No answer                          | 27.3             | -                |
| <b>Total</b>                       | 100.0%           | 100.0%           |

In section three of the survey, the best choice of every respondent was derived by adding up the number in the box of each class:-

- A, B, C, D - four types in the first class
- E, F, G, H, I - five types in the second class
- J, K, L - three types in the third class

A full explanation of what the letters indicate is given on page 369, Appendix K.

After the twelve cards were ranked, the interviewer wrote down the number according to the arrangement, eg. the first card on the top is the best choice, number one, if this card's code was E, meant E is number one. Total number of each class then compared, where the lowest average meant the best choice of class.

The following table illustrates how the ranking of choices works. The table shows results taken from six respondents on the basis of their arrangements of the cards. The lowest total in each class for each respondent represents the most preferred choice.

Thus, for each of the six respondents the most preferred classes are as follows:

**TABLE 6.6**  
**PREFERRED CLASS CHOSEN BY SIX SAMPLES IN FEBRUARY SURVEY 1990**

| Samples | Class 1 |    |    |    |    | Class 2 |   |    |    |    |    | Class 3 |    |    |    |
|---------|---------|----|----|----|----|---------|---|----|----|----|----|---------|----|----|----|
|         | A       | B  | C  | D  | T* | E       | F | G  | H  | I  | T* | J       | K  | L  | T* |
| 1       | 1       | 2  | 3  | 4  | 10 | 5       | 6 | 7  | 8  | 9  | 35 | 10      | 11 | 12 | 33 |
| 2       | 9       | 10 | 11 | 12 | 42 | 1       | 2 | 3  | 4  | 5  | 15 | 6       | 7  | 8  | 21 |
| 3       | 4       | 5  | 6  | 7  | 22 | 8       | 9 | 10 | 11 | 12 | 50 | 1       | 2  | 3  | 6  |
| 4       | 1       | 6  | 4  | 9  | 20 | 5       | 7 | 2  | 10 | 11 | 35 | 3       | 8  | 12 | 23 |
| 5       | 4       | 3  | 9  | 8  | 24 | 1       | 7 | 2  | 5  | 6  | 21 | 12      | 10 | 11 | 33 |
| 6       | 8       | 9  | 10 | 11 | 38 | 5       | 2 | 3  | 1  | 7  | 18 | 12      | 6  | 4  | 22 |

T\* = total

The next step is to divide the total of each class of every sample by the number of class type, ie. 4 for class 1, 5 for class 2, and 3 for class 3. This will give us the following result which shows the lowest average means the most preferred class by six particular samples.

**TABLE 6.6(a) : The Most Preferred Class By Six Samples**

| Samples | Class 1       | Class 2       | Class 3       | Best Choice |
|---------|---------------|---------------|---------------|-------------|
| 1       | $10/4 = 2.5$  | $35/5 = 7.0$  | $33/3 = 11.0$ | Class 1     |
| 2       | $42/4 = 10.5$ | $15/5 = 3.0$  | $21/3 = 7.0$  | Class 2     |
| 3       | $22/4 = 5.5$  | $50/5 = 10.0$ | $6/3 = 2.0$   | Class 3     |
| 4       | $20/4 = 5.0$  | $35/5 = 7.0$  | $23/3 = 7.7$  | Class 1     |
| 5       | $24/4 = 6.0$  | $21/5 = 4.2$  | $33/3 = 11.0$ | Class 2     |
| 6       | $38/4 = 7.6$  | $18/5 = 3.6$  | $22/3 = 7.3$  | Class 2     |



While for the type of service which related to speed the result is as follow:

TABLE 6.6(b) : The Most Prefereed Service By Six Samples

| Samples | Express      | Mail/N.S     | Ordinary      | Best Choice |
|---------|--------------|--------------|---------------|-------------|
| 1       | $33/5 = 6.6$ | $24/5 = 4.8$ | $21/2 = 10.5$ | Mail/N.S    |
| 2       | $37/5 = 7.4$ | $28/5 = 5.6$ | $13/2 = 6.5$  | Mail/N.S    |
| 3       | $36/5 = 7.2$ | $27/5 = 5.4$ | $15/2 = 7.5$  | Mail/N.S    |
| 4       | $33/5 = 6.6$ | $22/5 = 4.4$ | $23/2 = 11.5$ | Mail/N.S    |
| 5       | $34/5 = 6.8$ | $27/5 = 5.4$ | $17/2 = 8.5$  | Mail/N.S    |
| 6       | $31/5 = 6.2$ | $36/5 = 7.2$ | $11/2 = 5.5$  | Ordinary    |

So, whatever the combination is, the class with the lowest average becomes the best choice or the class which that respondent preferred. Fare and class (which reflectts comfort) are closely correlated aand can be considered together as one train attribute. On the other hand, journey time depends on the type of train, not the class, and can be therefore be regarded as second, distinct attribute. The numbeers of preferences for each type (speed) of train were therefore found in the same way as for class. The table compares the ranking of these two attribute.

TABLE 6.6(c) : Number of first choice according to class

| CLASS               |        |        |        |
|---------------------|--------|--------|--------|
|                     | CLASS1 | CLASS2 | CLASS3 |
| No. of first choice | 2      | 3      | 1      |

TABLE 6.6(d): Number of First Choice According to Service

| TYPE OF SERVICE     |         |           |          |
|---------------------|---------|-----------|----------|
|                     | EXPRESS | N.SLEEPER | ORDINARY |
| No. of first choice | 0       | 5         | 1        |

Table 6.6(c) and Table 6.6(d) above show that comfort appears to matter more to the respondents than journey time. Table 6.6(c) shows that respondents preferred class 2 to the other two classes. This means whilst they looked for comfort they were nevertheless unwilling to pay more for the comfort offered by first class.

Table 6.6(d) indicates that journey time (duration) does not feature as a consideration for the respondents. Although the journey time of the express service is shorter - 6 hours and 30 minutes, compared to the other two services which take longer with Night Sleeper taking 9 hours and ordinary service 9 hours and 45 minutes, none of the respondents chose the express service as their first choice. It appears that most of the respondents preferred NS because it travels at night, a time which interferes least with their daily activities. The ordinary train service offers more comfort (convenient) to the short-distance travellers because it stops at all stations, unlike the express train which stops at selected stations only. In fact the first survey conducted in 1987 also indicated that NS is a popular service. See table 4.3b.

Since no actual fare changes have yet to happened in the MR service, it is impossible to give a fare elasticity of demand now; but it is implied that without improvement in their



service, or if the service stays at the present level (in terms of comfort and travelling time), any increase in fare will result with some loss in demand.

(It is important to note that MR is now putting a case to the government to ask for approval to increase fares at the end of 1990, after the next general election. The chance to obtain more freedom in decision making is higher, since the government has agreed with the plan to corporatise MR after June 1990 - see APPENDIX M-2).

Therefore, in order to obtain some elasticity estimates so as to change fares without closing demand and revenue, we will try to apply a stated preference exercise. Using this approach, we can try to find out what might be the fare elasticity by measuring the individual utility weight for every trade-off respondents made between fare and travelling time and between fare and comfort.

## **6.7 Trade-off Method in SP Fare Experiment**

### **6.7.1 Background**

A most interesting difference between the analysis of Stated Preference (SP) data and the analysis of Revealed Preference (RP) data is that, with SP data it is possible to estimate a separate model for each individual respondent. This is possible because respondent provides enough information to identify all the parameters of interest. This facility is particularly useful for segmentation purposes, and allows the analyst to identify market segments with homogeneous preferences.

The objective of this SP method is to ensure that respondents can demonstrate their preference within a framework which is made as realistic as possible.

In the traditional conjoint analysis method experiment, the preferences are measured by asking respondents to compare a set of alternative products or attributes of a product, and to rank these into their order preferences. The rank orderings are then decomposed into utility weights for individual attributes, which allow the analyst to infer the relative importance of these attributes. The ready Multi-dimensional Scaling (MDS-package) like MONANOVA programme or maximum likelihood LOGIT is used to analyse data.

However, within these ranking methods occasioned researchers facing some problems such as:

- (1) The ranking of more than nine options is likely to pose a problem for certain categories or respondents, leading to a non-response bias problem.
- (2) The utility weights cannot be used to predict market share under different competitive conditions.

Therefore, they changed the traditional conjoint analysis to a conjoint choice approach. The differences between the two methods are:

- (1) Conjoint choice uses a different data collection procedure: It asks the respondent to compare only two to four alternative products or attributes or a product at once, usually one or two each of the best and the worst.
- (2) It uses a different analysis procedure; ie. using the multinomial logit (MNL) model, which is based on explicit choice theory.
- (3) It also uses a different simulation procedure: It predicts market share from predicted individual choice probabilities.



### **6.7.2 SP Survey in March 1990**

For the purpose of this study, the trade-off method with the modified conjoint choice as mentioned above will be applied. The survey is fixed on the long-distance travel for visiting purposes in the MR mainline service which involved two pairs of stations Kuala Lumpur to Singapore (Southbound) and Kuala Lumpur to Butterworth (Northbound).

This survey was intended as a test of the questionnaire design for trade-off analysis and as the necessary software had not been obtained, elasticities were not calculated. However, it helped to show that such an analysis was feasible.

This section will concentrate on the following elements:

- 1) Data collection procedure
- 2) Data collection instrument
- 3) The analysis of the data
- 4) The simulation tool
- 5) The result
- 6) Constraints and limitations.

#### **6.7.2.1 Data Collection Procedure**

The samples consist of fifty six students from the National University of Malaysia. Two days were spent by three assistants to gather the respondents by choosing those who had had the experience of travel and who were about to travel back to their hometown after their semester examination in the middle of March. The reason for choosing only those with that particular criterion is to ensure that they can make their choice in answering any

question based on their experience. So they have some idea in their mind to make a comparison between the train attributes which they need to consider.

The sampling method used here is more towards purposive sampling. It is between quota sampling and simple random sampling or convenience sampling. In this method the researcher uses her own judgment about which respondents to choose, and picks only those who she thinks best meet the purposes of the experiment. She uses her prior knowledge to choose respondents.

The respondents were gathered in a hall to answer the questionnaire, helped by some guidance from the researcher and her assistants. There are a number of reasons for conducting this survey in this way

- 1) The costs and time are the main constraint. Since the exercise session was conducted for all the respondents at the same time, the researcher guided them to answer the question without the intention to influence them to choose the answer. She read and explained what were the questions' requirements. When there was any query, the respondent asked the researcher straight away and everybody moved to the next question when they were satisfied with their answer. Therefore, the one hour period allocated was for the whole exercise and involved only small costs (which were to get soft drinks for respondents as a token payment and a few dollars were paid to the assistants).
- 2) There was not available sufficient terminals to do this exercise by using personal computers. The best way to carry out this exercise is for each respondent to be seated in front of the computer and to answer every question on-line. At the end of the session, by using the TOFPTA (Trade-off Procedural Text Analysis) model programme. This programme uses Trade-off Method as a model and Procedural Text Assessment as the



interface to meet users' need. The software consists of series of questions which pertain to a number of attributes that are relevant to a study. Users can put their preference of the attribute by answering the questions asked. The software then analyses the answers given by each user using the trade-off model and gives the weighted preferences of the attributes tested. At the same time, the software generates a consistency index ranging from 0-1 of the user's choices. An index of 0.3 or below indicates a low level of consistency and requires the user to go through the series of questions again until a higher score is obtained.

In order to overcome this problem the researcher emphasised to them how important it was to make-up their mind and to be consistent in their choice. Then, the researcher fed in all the data into the computer for analysis. After the analysis, six respondents were called up again to repeat the exercise on the following day since their ranking consistency was far ~~beyond~~<sup>beyond</sup> the limit of 1. They were traced by using their code, name and residents address.

- 3) The previous two surveys for this study (September 1987 and February 1990) have shown that 15 to 20% of MR's market is students and the main travelling purpose for them is visiting family (coming and going back from college to their home town for at least four times a year, as there are two Semesters in an academic session in Malaysia.)

These students will be one of the target samples for the future fare experiments. Other segments of the market (workers, housewives, retired persons and others) can be tackled in a different approach involving face-to-face interviews at the train station, in a town-hall, at their home or at other places suitable to these studies.

### 6.7.2.2 Data Collection Instrument

The questionnaire was divided into two sections. The first enquired about the respondent's background, the second part contained the trade-off exercise. In this section, respondents were given a pair of attributes combinations of:

- 1) Fare and travel time
- 2) Fare and comfort
- 3) Travel time and comfort

Every attribute has three levels. The present level is considered the worst and the other two are moderate and best. See APPENDIX L for details. This part of the questionnaire consisted of two types of questions. The first one tries to discuss the scaling constant of each respondent and in the other part a choice is made between the three pairs of the attribute.

### 6.7.2.3 Analysis of the Data

There were seven questions concerning the respondents' background which were analysed as follows:

|                                    |                                                |         |
|------------------------------------|------------------------------------------------|---------|
| Age:                               | 20-30 years old (96.4%), > 30 years old (3.6%) |         |
| Sex:                               | Male (51.8%), Female (48.2%)                   |         |
| Transport owned:                   | No transport (66.1%), Motorbike (33.9%)        |         |
| Last time travelled by train:      | more than 3 months                             | (71.4%) |
|                                    | less than 3 months                             | (28.6%) |
| Class of train travelled:          | Second class                                   | (53.6%) |
|                                    | Third class                                    | (46.4%) |
| Travelling frequency by train:     | 1-2 times                                      | (66.0%) |
|                                    | 3-6 times                                      | (26.8%) |
|                                    | more than 8 times                              | (7.2%)  |
| Plan to travel by train this year: | Yes (73.2%), No (26.8%)                        |         |

This background is important in order to discriminate the characteristics of this market segment.



The total number of samples was 56 - a response rate of 100%. An answer with a consistency index of 0.1 (10%) or less was taken as at a successful rate, i.e.  $46/56 \times 100 = 82.2\%$ . A 0.1 consistency index is allowed, because this is the normal level set by other researchers using TOFPTA. It was proved that very seldom one can get a 0.00 consistency index because the human mind cannot easily be controlled; even within the span of a few minutes, not many people can achieve consistency in choosing or decision making. In this survey, only 6 respondents (or 10.7%) scored a consistency index of 0.00. The unsuccessful rate was divided into two categories:

- i) Inconsistent ranking between part B and part C = 6 samples = 10.7%.
- ii) Consistent index bigger than 0.1 = 4 samples = 7.1%.

The successful samples of 46 can be analysed as following:

- (i) Those who preferred Comfort (C) to Travelling Time (TT) or to Fare (F)

$$C > TT > F = 17 = 30.4\%$$

- (ii) Those  $TT > C > F = 23 = 41.1\%$

- (iii) Those  $F = C = TT = 6 = 10.7\%$

$$\begin{array}{rcl} \text{Total} & 46 & 82.2\% \\ & == & ===== \end{array}$$

Therefore:  $TT > C > F$

On average, the respondents placed three attributes, second as follows:

$$\begin{array}{rcl} \text{Travelling Time} & : & \frac{17.911}{46} = 0.389 \end{array}$$

$$\begin{array}{rcl} \text{Comfort} & : & \frac{15.86}{0.368} = 0.346 \end{array}$$

$$\begin{array}{rcl} \text{Fare} & : & \frac{12.228}{46} = 0.265 \end{array}$$

Thus, the respondents placed the importance of travelling time as 38.9%, while comfort is not far from it, 34.6% whereas fare was considered not a very important factor in determining their decision to travel by train, i.e. 26.5%. If similar results were obtained from a wider range of sample groups we might conclude that the public preference showed a bigger elasticity on service quality than on fare, see (ECOSOMETRICS - 1980 and LAGO - 1981) as examples.

However, this generalisation is not true all the times because service elasticities vary considerably from one place to another, and by time of the day/year (peak or off-peak), service quality and other classification of the market segment.

As suggested earlier no definitive conclusions can be drawn from this SP survey. However, it does effectively demonstrate the practicability of carrying out studies in this way and hence MR could use this method on an experimental basis. In addition it provides some practical information about resources in terms of costs and manpower required to carry out in proposed experiment. It is also helpful in indicating how the SP methods for MR may be designed in order to reduce costs, for example, by using a portable computer for interviewing. It shows how the questionnaire design may be adapted to suite local cultural conditions taking into account the level of respondents' understanding to ensure their co-operation in giving the required information.

#### **6.7.2.4 Limitations**

There are some constraints which limit our plan to fully exercise SP methods. Firstly, there was no evident way to obtain access to a MONANOVA programme either in Malaysia or Singapore during the four months spent by the researcher collecting, analysing and studying in Malaysia. Therefore, a modified programme of TOFPTA was substituted for analysis of the data from a survey on a control group in March 1990. However, the



researcher will try to obtain the programme from England for further research after this study.

Secondly, until the first half of 1990, MR remained unable to persuade the government to agree to change the fare structure, which was last reviewed in August 1984. However, the new fare increase proposal will be brought before Parliament sometime before the end of this year, parallel with the plan to corporatise MR. The Bill on this corporatisation will be debated in Parliament in June 1990. So, hopefully as a 'real' corporate body, MR will have freedom to implement its new policy, including fares. In this case, the kind of approach and analysis (measure the fare elasticity of demand using RP & SP methods) we have advanced, can be carried out more meaningfully and effectively.

Lastly, there are cost and time limitations to widening our scope by including other modes of transportation. Cross-sectional elasticity would then be involved wherever we could estimate by how much, if the train fare changed, MR would gain or lose its market from or to other modes of transportation. This is an important aspect of determining market share and of forecasting future demand, as well as for forecasting revenue and set this up the investment planning required to cater demand.

#### **6.7.2.5 Conclusion**

The main market for train operation in Malaysia is for long distance services where demand remains at a medium level throughout the year and at a high level during festival days. The latter normally occur over about 5-6 weeks in a year (Hari Raya, Chinese New Year, other religious and national festival days and school/college holidays). Medium-distance travel covering between about 100 to 150 km is not as popular as long distance, but the plan for the double track between Seremban and Rawang will probably change the trend. The second track is now under construction and is planned to be opened in 1993.



Short-distance services meant for commuting only have been offered by railbus since early 1989 and are successful from MR's point of view because they contribute a 'good' percentage of income. In spite of all sorts of complaints from the public in terms of quality of service, trains are always full. Completion of the aforementioned second track, plus direct services from Kuala Lumpur to Subang International Airport, will open bigger markets to MR and also enable this study of fare elasticities using an SP experimental approach to be fully and properly conducted.

Improving the service level, and providing bigger capacity during festival times are more important to MR in its attempts to cater for the low and middle class income public with big family (where maximum net income is about M\$1000).

MR need to upgrade the third class of mail and ordinary train services to become second class like the express service, thus eliminating the third class service. Upgrading and proper maintenance of the present signal system and rail tracks are also very important in order to ensure that the train can move according to schedule and ensure a very low level of delay.

About 80% of the respondents in the first survey (1987) were willing to pay extra if MR was able to offer them some extra facilities like guaranteed seat and refreshment in all classes of service – (refer to Q38, Appendix E). While the second survey (February 1990) also shows that comfort and journey time (as combined attribute in the questionnaire) are the highest priority rather than the fare (see point 6.6.4 ).

The third survey indicated that the most important factor which influences the sample (students) is the travelling time followed by quality of service (comfort in particular) and the least important factor is fare. Thus, the samples from this particular group prepared to pay certain increments upon the old one (up to 15-20% more) as long as the travelling time



is reduced (a reasonable 1 to 2 hours less than the present long-distance travelling time to or from Kuala Lumpur). Travellers are also looking for a comfort level better suited to what they are prepared to spend.

In fact, both this empirical study and the experience of MR personnel implied that to apply SP & RP methods with actual fare changes as a way to forecast demand and revenue is not something incapable of achieving. One would be able to do it just as soon as MR became free to take its own decisions.

### **Part Three - Experimental Proposal**

#### **6.8 Feasibility study of the experiment**

This section will discuss a complete project proposal for MR to consider as part of their action learning process. However, if MR does not agree in full and gives less support, the researcher will take this project as her own research project under the National University of Malaysia (UKM) research budget for 1991. In the latter case, this proposal will include the cross-sectional evaluation of other modes such as coach and car. Whatever MR's decision, full or part support, the researcher was guaranteed access by top management for compiling the data and information needed. They also promised to allow access to free travel anywhere and anytime in order to collect data on train, conditional only upon prior arrangement with their officer-in-charge.

One now needs to investigate the possibility of carrying out further studies by appraisal of the following factors:-

- (i) Proposal of what can be done.

- (ii) Amount of time and resources that will be required in order to conduct the experiment (resources - money and staff).
- (iii) Kind of result we are expecting from it.
- (iv) What monitoring is needed in the exercise.
- (v) Risk assessment in terms of:
  - (a) passenger reaction toward fare changes.
  - (b) likely effect from using the estimated elasticity. Let us say we use the elasticity for the express service as  $-0.9$  but after the experiment we found out that it was  $-0.6$ .

Another reason for proposing the experiment is to try to provide MR with a good framework to adjust its fare. We hope to give to MR enough guidelines for them to know that they have the resources to do the experiment, we have the methods which can be performed and that the risk is measurable.

The approach for this experiment is a “before and after” study. This means data on passenger travel, and fares (demand and fare) will be collected before and after the new fare has been instituted.

#### **6.8.1 The objectives of the experiments**

- (1) The most important objective is to estimate the fare elasticity of demand of MR services under the following categories:-



- (i) According to market segment
- (ii) As an aggregate

Eventually these estimates can be used to assist MR to forecast their demand in the short-term, e.g. every 4 to 6 months, as well as to forecast revenue.

- (2) To ascertain if MR plan to increase their fares, whether they should do by market segment (type of service, class of service, travelling purpose, distance) or by a blanket rate.
- (3) To make comparisons with other modes, for examples coach and car, to ascertain what is MR's market share. So, if train - fares change and/or the quality of service improves, to what extent will they gain/lose their market share to other types of transportation. This probably can be estimated utilising cross-sectional analysis.
- (4) To enquire with regard to the rail service alone, without comparison with other modes, which one is more important to travellers - fare, or quality of service; or maybe both are strongly interdependent.
- (5) To discover whether the rail service is important to the public, and if so, how great is the level of this importance. Also, whether the travelling public can go without a rail service.
- (6) To determine the short-distance services, especially the commuter services, have good prospects. This is to evaluate the usefulness of double tracks planned to be opened by 1993.

### 6.8.2 Timing the experiment

The target date to experiment with the new fare is around September 1991. It has to be 1991 because the researcher will complete this thesis by June 1990. Therefore from October 1990 and until the two thirds of 1991, time has to be spent on planning and negotiation with the other relevant bodies or ministries as Ministry of Transport. In principle, MR agrees to launch this experiment so long as the cost is reasonable for them. Another requirement from MR is, the researcher has to show in the proposal that this experiment will not cause damage to MR operations in terms of revenue. During the negotiation period, we have to make the parties involved understand the method, strategy and implication of this experiment both in their current operations and future planning.

The three phases of experiment are as shown in Figure 6.1. Every four months, there will be a survey covering a period of seven days in order to include both weekdays and weekend. The exact date will be decided later, but the main criteria is that one (the first phase) must fall during the school and college/university vacation (October and November), and one (the second phase) during the festival time of Muslim or Chinese New Year celebrations around March 1992. Thus the other survey, between April to July 1992, will fall at the end of May and beginning of June (Middle of the year) - the quietest time of all.



### 6.8.3 Data from MR statistics

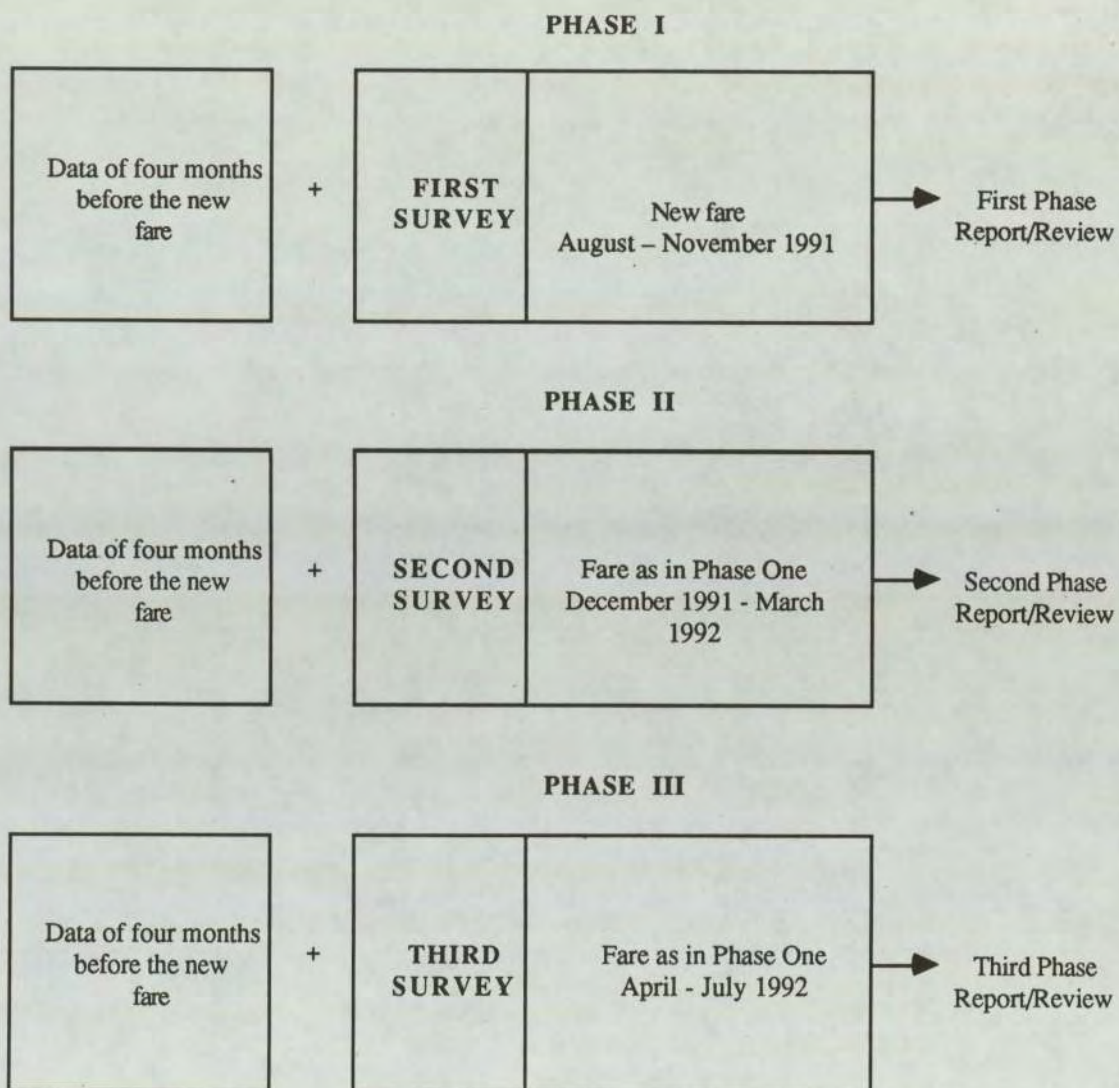
The data needed are passenger km, passenger journeys and passenger revenue, which will be classified according to type of service and types of ticket. These data will be for the four months before the experiment, ie.: April to July 1991. The fare is expected to change around August 1991. The second group of data will be for the period of August to November 1991 the third group will be from October 1991 to March 1992 and the last group will be from April to July 1992. Although MR already use computers for data recording, the process is still slow, so the fourth group of data cannot be assumed to be ready before October 1992. These dates are provisional and could be staggered forwards or backward at similar intervals in the event of any changes of new fare increment.

This data will enable us to calculate the fare elasticity according to time, type of service, and class of service only. Unfortunately it cannot indicate other details which fall into journey purpose and personal characteristics such as age, employment/student, pensioner, number in household, car ownership, travelling habit/pattern, income, journey frequency, opinion about fares or other factors which determine travelling demand. There are three places to conduct the survey: on board train, at the railway station; and at home (the latter indicates potential travellers).

#### 6.8.4 Survey

The survey schedule is as follows:

**FIGURE 6.1**  
**EXPERIMENTAL PHASES/SURVEY SCHEDULE**





The first survey will be conducted during the last two weeks of July 1991; the second survey in the last week of November 1991; and the third survey will be in the last week of March 1992. The first survey needs more time because it will include the time needed to choose the samples at the station and at home; as for those who do not intend to travel at all within the next four to eight months, they would not be interviewed. The target sample will consist of those passengers at rail stations and on board train who are planning to travel again and would be willing to be interviewed again, plus those who intend to travel within the next few months. Therefore the name and the address of each of the respondents must be taken in order to contact them again for the second and third interview.

#### **6.8.5 Research Instrument - Questionnaire**

The questions will be divided into three parts as follows:

- Part I:**                Personal background: this includes age, sex, net personal income, occupation, household component (size, age, income), transport ownership, and willingness to participate in the next survey.
- Part II**                Travelling activities: including the main purpose of travelling; travel frequency by train; when next planning to travel by train, the pair of station involved in the journey, and the class and type of train.
- Note:**                Part I and II above are needed in order to get information for market segmentation.

Part III                      Trade-off exercise:    with emphasis upon the individuals' stated preference for alternative rail attributes - i.e. fares, comfort and travelling time, as shown in detail in the following table.

**TABLE: 6.7**  
**THE RAIL ATTRIBUTES AND LEVEL TO BE CONSIDERED**

| Attributes     | Level                                                                                          |
|----------------|------------------------------------------------------------------------------------------------|
| 1)    Fare     | 1.    Current fare<br>2.    % of increase - 5%, 10%, 15%<br>3.    % of decrease - 5%, 10%, 15% |
| 2)    Journey  | 1.    Current time<br>2.    1 hour shorter<br>3.    2 hours shorter                            |
| 3)    Comfort* | 1.    Current level<br>2.    10% improvement<br>3.    20% improvement                          |

\*    Comfort here is seen in terms of spaciousness, privacy, facilities, cleanliness, airconditioning and a guaranteed seat.

**Notes:** It is easy to deal with changes in fare and journey time because the percentage change can be shown in figures (dollars and hours). In case of comfort, the percentage improvement can be shown to the respondents by means of a picture drawn on a card, e.g. bigger space (measurement), cafe attendants will come to serve them rather than they having to go to the café. At the moment, this service is limited to first class only.

The weightings can then be translated into monetary values by relating each to the weighting obtained for the fares variables. The derived monetary values will each show the amount that passengers would be prepared to pay for a given service improvement.



The main purpose of the first survey is to find out what actually are their previous, present and future plans regarding travelling if the train fare is increased. The second survey is meant to check the percentage of survey sample units which actually do travel as they planned. If they do not carry on with their plan we shall want to know what are their main reasons. The third survey, taken eight months after the new fare is to be implemented, will be in order to see what are the effects of the fare changes over a longer period. Normally, after six months (from the other railways' experience) the public try to adapt their travelling habit to the fare changes. Other factors such as promotion by MR of their services and special offers, changing income, car ownership or preferences switched to other modes, will also have to be taken into consideration when changed opinions and altered travel activities are assessed.

#### **6.8.6 Sample**

The sampling method selected is that of a random stratified type utilising face-to-face interviews on the basis of a closed questionnaire comprising some (thirty or so) questions. The reasons underlying this choice arise from the need to underpin the validity of the sample obtained by confining it to a specific and limited time period of seven days; by selecting those MR services which are both more suitable for fare experimentation and geographically separated; also by the need to employ two five-person teams once for each of the two rail sectors, one north and one south of Kuala Lumpur.

This use of ten enumerators (probably) comprising students/graduates from the Faculty of Business Management of the National University of Malaysia (where the researcher is attached) and MR staff encourages the use of a standard printed questionnaire. Experience from the surveys already undertaken and used for this research shows that spoken questions in sequence avoid the frequent spoiling of questionnaires by respondents who



have been handed a long document to complete by themselves, and also provides returns within a common format, so aiding analysis.

About 500 respondents will be interviewed, 300 on board train, 135 at home according to the address given by those who interviewed in February and March 1990 surveys. Another 65 can be at other places, e.g. in the office, bus and taxi termini. If possible the (135 + 65) respondents will be gathered, about 40 at a time, in a hall or in a room at a railway station. These portions of respondents (200) can be contacted in-advance by letter or personal approach by the research team. By contrast the 300 respondents on board are on-the-spot sample, stratified by type of ticket, and the survey will be conducted there by face-to-face interview.

Since the purpose of conducting three surveys is to facilitate comparison of elasticities provided from stated preference and revealed preference - before-and-after fare changes – each respondent is asked to give his name and home address where they can be contacted at a later date. Thus, only those who are willing to be interviewed again are chosen as sample units.

It is quite probable that a percentage of respondents for the coming First Survey will no longer be found at their stated address at the time of the second survey (4 months interval between first and second survey), since they may have moved, or even died, during the interim. This raises the problem of finding replacement interviewees, and/or of scaling down the sample. It has to be noted that a proportion of the numbers comprising revealed preference will not therefore be identical with those featuring in the stated preference results.

However if the purpose of sampling is borne in mind, substitution of some individuals for others should not greatly alter the general result, or pattern, revealed by large numbers.



Sampling units, although divided percentage wise between first class (20%), second class (45%) and third class (35%) passengers and split between north and south can at first approach be regarded as homogenous from the statistical standpoint.

One could also ask replacement respondents what would have been their stated preference several months ago, and compare it with their actual preference as revealed by answers to the second survey questionnaire. Admittedly, the danger of bias is thereby magnified, for the availability and advertisement and actual experience of revised fares and qualities of services, will most likely have altered respondents recollected preferences over a protracted time-span. Replacement respondents elasticities should thus be separately calculated alongside the “control” elasticities of those participating in both first and second surveys.

A further consideration arises if the second survey is extended to include the whole railways network, instead of just some MR services (howbeit important ones) as in the first survey. It will in each eventuality become essential to specify the scope of the survey actually undertaken, when revealing the elasticity result(s) obtained, as well as the proportion of respondents featuring in both surveys.

#### **6.8.7 Survey findings**

Survey data will form the input for the elasticity measurement under the following headings:; journey purpose, sex, age range, distance, income range, type of tickets, type of service, journey direction (southbound or northbound and back to Kuala Lumpur); peak and off-peak time – in a day, a month, a year and optional (festivals time).

The five components forming methods of measurement both utilised for Revealed Preference (RP) and Stated Preference (SP), are as follows:

- (1) (Data of 1 week before the new fare) ÷ (data from the 1st survey) - SP
- (2) (Data of 4 months before the new fare) ÷ (data of 4 months after the new fare - Phase I) - RP
- (3) (Data of 1 week before the new fare) ÷ (data of the 2nd survey) - SP
- (4) (Data of 4 months before the new fare) ÷ (data of the 2nd four months after new fare - Phase II) - RP
- (5) (Data of 1 week before the new fare) ÷ (data of the third survey) - SP
- (6) (Data of 4 months before the new fare) ÷ (data of the third four months after new fare - Phase III) - RP

It will be important to formalise an exact procedure for relating changed fares to changed revenue as results of the experimentation come in. Information will appear in the form of ticket sales and it is suggested that these should be divided between the main stations and classified according to service and timing, with segmentations extending from Kuala Lumpur to Singapore and Kuala Lumpur to Butterworth. The focus will be upon whether these preliminary localised results reveal an elasticity lying inside or outside the ranges upon which the experimentation has been conducted.

We should use the same formula for mid-point elasticity as explained in Chapter 5:

$$E_{\text{point}} = \left( \frac{P_2 - P_1}{P_1 + P_2} \right) \left( \frac{X_2 + X_1}{X_2 - X_1} \right)$$



We need to make several comparisons of elasticity values: *first*, to find that revealed by stated preference of the travelling public at hypothetical fares/services contrasted with actual current demand for existing fares/services; *second*, to find that arising between revealed preference before the fare change and revealed preference after the fare change; *third*, to find any longer term change in fare elasticity of demand arising between initial revealed preferences and later ones, once the new fare/services have been properly established and understood.

In the first case, one can utilise the researchers study; in the second, the experimentation and first survey will provide the data; in the last case, the second and third survey will furnish the information. If the results show elasticity of demand at the new fare of a lesser magnitude than that of the estimate - ie an inelastic response, one may safely continue with the experiment. If on the other hand, this comparison demonstrates a higher magnitude than that of the estimate - ie: a more elastic response, having a larger negative number (eg. more than -1.1) one should proceed further only with caution.

Indeed, if the new elasticity exceeds a value of -1.0, it is inadvisable to continue with the new experiments unless some recognisable improvement in the quality of service can also be implemented. In both situations, it will be necessary to compare the total revenues from before and after the fare increase, to take expenses into account, and so calculate the net revenue.

It is of course implicit that short-term elasticities and revenues resulting from the changed fare may differ from those recorded in the longer run. The degree of risk faced by the projects as a whole may be assessed by means of a computer simulation utilising a range of costs and elasticities. Many of the costs incurred will be calculable within a small margin of error from MR experience of normal operating and personnel costs, as well as from work already undertaken by the researcher. Elasticities may be varied at will.



#### **6.8.8 Research team options**

There are three possible options for constituting a research team to conduct the experiment using RP and SP depending on the extent to which MR and UKM are prepared to participate in the study. These options are (1) a project conducted by MR alone; (2) a project conducted by UKM alone; or (3) a joint research project involving both MR and UKM.

All of these options will require a steering committee to monitor the performance of the research team. The steering committee will meet once every two months when the head of the research team will present a progress report. This will ensure that the research is being carried out within the terms of reference of the project and according, to the timetable. If there are any problems the steering committee may then be able to help by either bringing in additional resources or by ensuring the most effective use of the existing resources.

The following outlines the recommended composition of the research teams and the steering groups for each of the possible options.

##### **(1) MR Research Team Option**

For the first option where the project is set up within MR the researcher will act only as a co-ordinator. Costs will be shared in the ratio of 80:20 between MR and UKM respectively.

The steering committee and the operational team for the project would be constituted in the following ways:

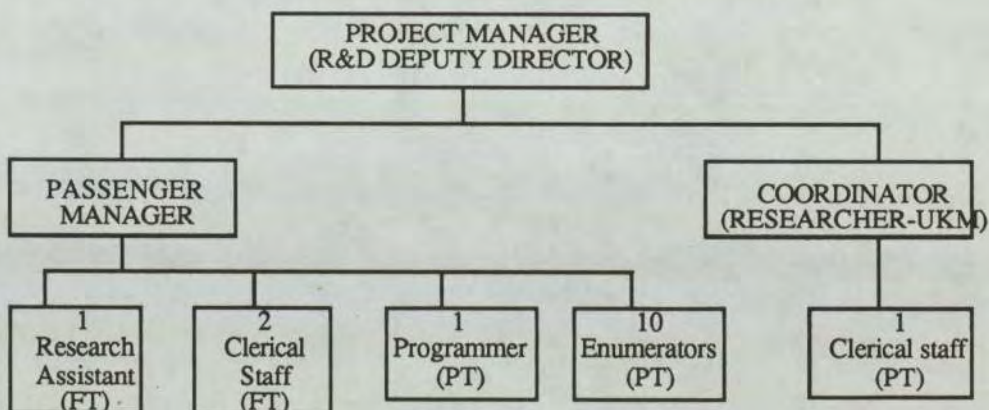


(a) **The Steering Committee**

The steering committee within MR should consist of a Deputy Manager; the Director of R & D; the Director of Finance; and the Manager of the Computer Department.

(b) **The Operational Team**

The composition and structure of the operational team is outlined in the following diagram.



Note: FT = Full-time

PT = Part-time

The prospects for the realisation of this proposal will depend on a number of factors current at the time. These will include the board of management of MR as well as political, social and legal constraints.

The project manager provides a link between the decision - maker (the MR policy maker) and the middle management and lower management (Section heads and stations

managers). Therefore, all sections which are involved in the experiment will work according to the plan (within the time limit and the expected costs). With a smooth communication flow, the project can achieve its objectives. Previous experience has shown that to obtain a good communication environment is one of the vital jobs of a project manager. Thus, it needs a very good person, having experience and with a strong personality. Previous experience of typical developing countries showed that this is the deficiency faced in this kind of business, specially in a government agency.

## **(2) UKM Research Team Option**

For the second option the research team will be derived totally from the National University of Malaysia (UKM).

The Steering Committee and the operational team for the project would be constituted in the following ways:

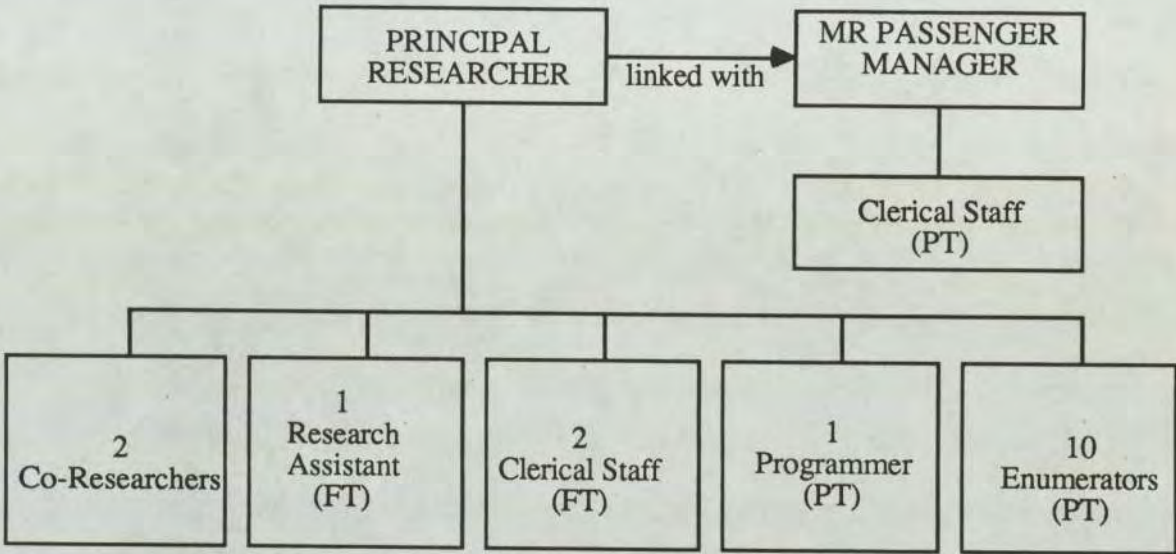
### **(a) The Steering Committee (UKM)**

This would consist of the Director of the Research Bureau; the Bursar; the Head of the Computer Centre; the Head of the Research Committee at Faculty level.



**(b) The Operational team**

The composition and structure of the operational team is outlined in the following diagram:



In this case the estimated total costs will be around M\$35,000. This would be shared in the ratio of 20% from MR and 80% from UKM.

The principle researcher is responsible for liaison between the UKM Research Committee and MR management. The UKM Research Committee is not answerable to MR management since in this case MR's role is only as a supplier of data, information etc.

Before the actual project is begun the principal researcher will need to establish the link with the MR representative to ensure good communications. The project will require personal visits to MR to collect data and to conduct some interviews. The other researchers will also try to maintain good contacts with MR.

Only those parts of the project proposal which directly concern the MR will be presented to them. Similarly, at the conclusion of the project it will be necessary to tailor the report of the findings appropriately for the MR and the UKM. The report for UKM would contain a fuller account of the work and would adopt a more academic approach. The report to MR would focus on managerial, marketing and political aspects relevant to MR.

MR is unlikely to introduce fare changes as a result of the experiment. (It is important to note that fare changes will occur irrespective of which of the project options is adopted for the RP and SP experiment). The plan to change fares is dependent on the passage of a Bill in the Malaysian parliament in June 1990. MR's Acting Manager is convinced that the implementation of new fares will be sometime in 1991 (probably August) according to when the country's general election is held.

### **(3) MR and UKM Joint Research Team Option**

The third possible option is for a joint research project between MR and UKM. Adopting this approach will require that the results of the study would have to be analysed from the perspective of a government business agency and from an academic perspective satisfying university requirements.

In this case the Steering Committee and the operational research team would be drawn from both MR and UKM in the following ways:

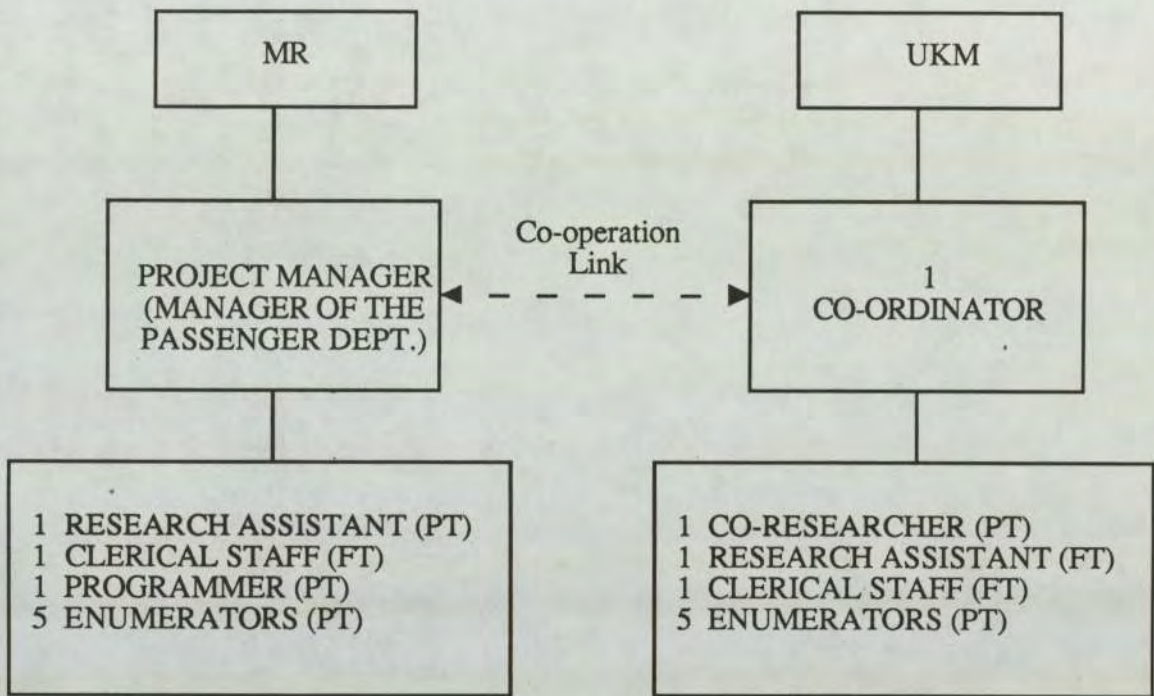
#### **(a) The Steering Committee**

This would consist of the Director of R & D and the Assistant to the Director of Finance from the MR and the Deputy Bursar and the Head of the Faculty Research Committee for the UKM.



**(b) The Operational Team**

The joint operational team for the project would be composed as indicated in the following diagram.



**6.8.9 Cost of The Survey**

This will include costs necessary to collect ready data from the MR data base; secondary information from other sources like the National Statistical Department; and also costs required to carry out the three surveys, plus the preparation for the survey until and including the final report of the whole experiment.

Some of the main headings under which costs would be incurred in the case where actual fare experimentation takes place are as follows:

1. Management time in appraising the project, issuing instructions, monitoring results, including response of rival organisations.
2. Preparing, printing, and distributing questionnaires and filing returns.
3. Selection/training/briefing of small team of enumerators or other research assistant(s).
4. Preparing lists of previous respondents for enumerators.
5. Paying enumerators (if not already paid staff).
6. Computer time spent on programming, filing, analysis reports, printouts etc.
7. Time spent on project appraisal and policy adjustment.
8. Implementing an advertising campaign to tell public about changes.
9. Issuing enumerators with temporary free travel passes during survey.
10. Exercise to offset change in total revenue (hopefully on increased contribution) with total costs - including the costs of fare experimentation and second survey (as listed above).



11. Research Committee allowance.

12. General expenses.

The total cost of M\$35-50,000 is required and it is only an estimated amount which is based on 1987 prices; it is subject to change according to standard current costs at the time of implementation in 1991 and 1992.

The number of research team members for each of the three options was discussed in detail in section 6.8.8. In each case this would lead to different costs. This results from the variations in the types of people employed on the projects; whether they are part-time or full-time; the nature of their duties; and time spent on the project in terms of man hours. However, there are tasks which would be required for each of the options and which we refer to as common expenses. These may be listed as follows:

**Common expenses**

|                                                              | M\$               |
|--------------------------------------------------------------|-------------------|
| 1. Questionnaire preparation                                 | 2,000             |
| 2. Selection/training of assistants                          | 500               |
| 3. Preparing list of panel/repeat respondents                | 500               |
| 4. Enumerators                                               | 7,500             |
| 5. Programming, filing, analysis, reports,<br>print out etc. | <u>10,000</u>     |
| TOTAL                                                        | M\$ <u>20,500</u> |

**Costs for option 1: MR (80%), UKM (20%)**

|    |                              |                   |
|----|------------------------------|-------------------|
| 1. | Management time              | 10,000            |
| 2. | Advertising                  | 10,000            |
| 3. | Research Committee allowance | 8,000             |
| 4. | General expenses             | <u>1,500</u>      |
|    | SUB-TOTAL                    | 29,500            |
| 5. | Common expenses              | <u>20,500</u>     |
|    | TOTAL                        | M\$ <u>50,000</u> |

**Costs for option 2: UKM (80%), MR (20%)**

|    |                              |                   |
|----|------------------------------|-------------------|
| 1. | Research Committee allowance | 13,500            |
| 2. | General expenses             | <u>1,000</u>      |
|    | SUB-TOTAL                    | 14,500            |
| 3. | Common expenses              | <u>20,500</u>     |
|    | TOTAL                        | M\$ <u>35,000</u> |



### Costs for option 3: MR (50%), UKM (50%)

|    |                              |                   |
|----|------------------------------|-------------------|
| 1. | Managerial time              | 6,500             |
| 2. | Research Committee allowance | 8,000             |
| 3. | Advertising                  | 5,000             |
| 4. | General expenses             | <u>2,000</u>      |
|    | SUB-TOTAL                    | 21,500            |
| 5. | Common expenses              | <u>20,500</u>     |
|    | TOTAL                        | M\$ <u>42,000</u> |

### 6.9 Decision-taking

Not all risks are financial in character. The proposed course of action may have several far reaching implications at top levels of decision making in MR. It may involve close integration of commercial with financial aspects of enterprise direction, itself dependent upon an altered political perspective of what needs to be achieved by way of greater autonomy for MR and the opening up of opportunities to improve contributions so as to turn around the present loss-making operations into a more profitable basis for its future. Decision will thereafter be required as to the suitability of timing of any changes, and what the new fare levels and qualities of service shall be. These must in turn take account of economic factors and conditions in the travel market generally, for appraising which market research is essential.

## **6.10 Operational plan**

### **January-March 1991**

Negotiation, meeting briefing re: experimental proposal with MR management - Deputy manager 1 and R&D Division

Adjustment with the base figure for the simulation using the trend of 1987, 1988 and 1989 (if possible)

Negotiation with the Ministry of Transport, Advisory Board of MR and other related bodies.

Research proposal to National University of Malaysia (Faculty of Business Management)

### **April-May 1991 Survey**

Form a small research team in National University with MR representatives

Preparing printing of questionnaire for pilot survey

Briefing the research assistants/numerators for pilot survey

Rewrite the questionnaire, train enumerators.

Training for using MONANOVA package to analyse data from survey.



## **May-June 1991 - MR**

Preparing for the fare changes exercise

- (i) Ticket printing
- (ii) Staff training (if necessary)
- (iii) Timetabling and preparing timetable and fare schedule leaflet.
- (iv) Carry-out some advertising of the new fares (or some other way to inform the public about the new fare and train time table).

Planning of how to collect data (from ticket sales) on time

NOTE: Last week of June - carry out the actual first survey

Implementing new fare as in proposal

Analyse data of the first survey

Validate data

Prepare report

### **End of October or sometime in November 1991**

Second survey redesign the questionnaire (if it needs some alteration on the first survey questionnaire).

Analyse data.

Prepare report

Comparison of findings between first and second data especially on the elasticity estimates.

### **End of December 1991 - January 1992**

Get the data ready (passenger statistics of MR on the new fare).

Analyse these data to calculate another elasticity measurement based on actual behaviour (from the ticket sales)

Preparing report

Comparison of all the elasticity values which have been measured/estimated so far, from the initial estimates in the thesis, from three surveys (stated preference and from actual travelling activity (revealed preference). Draw conditions and make recommendations for the next plan.



### 6.11 Setting the fare

There are four steps which can be proposed to MR in setting their new fare in the future after twelve months of experiment, which are:

**Step 1** – Calculate cost per Km according to reverse formula by White (cf: see 4.2.3) in order to find the basic fare per Km. Detailed costs classified into type of service and class are needed for this purpose.

**Step 2** – Compare the fares derived in Step 1 with the fares of other public transport and cost of petrol. At the same time refer to government regulation on the ‘ceiling and floor’ level of fare (If MR still tied by ‘that’ regulation).

**Step 3** – Calculate the fare elasticity of every type of ticket in two categories:

- (a) short distance (less than 40Km)
- (b) long distance

**Step 4** – The final stage is for MR to determine their fare as following:

- (a) amount of percentage fare increase
- (b) amount of percentage for discounts
- (c) amount of extra payment for travellers who prepare to move to the better seating/sleeping accommodation (if available) while they are already on board.

## 6.12 Conclusion

Since there is no work yet on fare elasticity estimates in MR we tend to use the estimated figures of other railway systems. Later, an experimentation on fare rise will be carried out in order to calculate MR's own fare elasticity.

The collected works from 1970 to 1988 on rail or rail and bus for inter-urban service yielded the range from -0.1 to -1.81 in advanced countries and one study (in a country very much similar to Malaysia, ie. Zimbabwe) gave an average elasticity of -0.6. After consideration and analysis of the available evidence the researcher decided to use a range of -0.6 to -1.5 ( $\pm 0.2$ ) for MR. Experiments will be launched probably in mid-1991 for a period of twelve months. There will be three surveys and both methods of elasticity estimation (SP and RP) will be applied.

Improvement in service quality will still have the chance to attract more customers although at the same time the fare also increased. Nearly six percent of the respondents in the February 1990 survey showed that a little extra dollars are not a problem for them to pay in order to go up to the better facility class of train while already on board if the seats are available. This suggests that the travellers are looking for a better service quality and this view is supported by evidence from studies done in other countries.

The conjoint analysis and trade-off models kind of survey have to be designed very carefully to ensure that both the research group (the MR Steering Committee for this experiment) and the respondents be able to understand it. The choice of two to three attributes with three levels make for a manageable start. The short, simple but adequate questionnaire will encourage the participants to be consistent in their choice.



Eventually, this work (this experiment) might be used by MR to persuade the government to change their attitude towards MR. In fact the MR management was impressed by the findings and suggestion so far. They planned to include some points from this study in their process of fare review in the future. See Appendix M-1.

The Government expects MR to operate profitably, which means less subsidisation, and at the same time MR has to carry the burden of social responsibility - good service but cheap fares. The other types of transportation operators are able to avoid this condition, because they do not operate as a government-controlled commercial organisation. In order to complete effectively MR itself must become an organisation on the move – both through experimentation and adaptive response.

## **CHAPTER SEVEN**

### **IMPLICATIONS OF THE STUDY**

#### **7.1 Introduction**

This chapter mainly sets out to show MR what are some of the implications of its using the elasticity of demand concept as a way to manage the fare structure so as to increase revenue. This approach includes appropriate segmentation of the market; regular surveys and analysis of customers' need; and more frequent fare changes based on these factors widely held to determine transport demand.

Clearly, MR management/administration needs to become involved and fully motivated and committed to both policy and operational aspects of this experiment, which should be seen as part of an overall plan to improve the functioning of their existing organisation. At the same time it must be recognised that this can only be part of a broader attack on MR's problems.

It seems clear that the Board of advisory bodies and ministries at present controlling MR management should delegate more decision-taking power to MR. Therefore, this chapter will also make out the case for increased delegation to enable MR to carry out its commercial role more effectively.

#### **7.2 Elasticity concept as a method of measurement**

Public transport as a service is one of the most perishable of goods. Once the train moves from the terminus, the empty seats become useless, meaning that no revenue is being generated by them for that particular service at that time, whereas maintenance and other



related costs have already been incurred. Thus, we need to find out a way to improve train utilisation.

This study has outlined a procedure for fare changes based on the elasticity of demand concept. This appears to be a sensible method, with considerable potential for “fine-tuning”, provided that one is aware of its limitations. In this study a group of selected MR services was chosen and carefully estimated fare elasticity values allocated. The fare was increased by a higher percentage for those services with lower elasticity values (towards -0.1) and by a lower percentage for those services with higher elasticity values ( $\geq -1.0$  ie: a bigger negative value).

The indications are that some services are high in demand at all times and in all directions. Another group of services appear only popular for certain times and there are groups of services which remain unpopular at all times. Data from ticket sales during the three years under study show these trends (1984-86) and train occupancy data for 1987 exhibit in detail the demand in every class of service for each type of train. The scope for fare adjustments becomes self-evident.

Whenever a significant number of passenger seats (say, ten) on any train service remain vacant, not only is no revenue earned from their provision, but since unit costs of maintenance (UCM) are involved, the average net UCM will increase. This loss of potential revenue is obviously greater when better class accommodation stays under-utilised (ie. first or second class, air-conditioned sleeping berths), and – the increase in average net UCM also becomes greater.

|                          | Situation A           | Situation B          |
|--------------------------|-----------------------|----------------------|
| Seats available          | 30                    | 30                   |
| Seats taken              | 28                    | 21                   |
| Percentage of occupancy  | 95%                   | 70%                  |
| Percentage of vacancy    | 5%                    | 30%                  |
| Fare per seat            | M\$ 40                | M\$ 40               |
| Revenue                  | M\$ 1120 <sup>†</sup> | M\$ 840 <sup>‡</sup> |
| Cost (variable)/30 seats | M\$ 900               | M\$ 900              |

$$^{\dagger} \quad 28 \times \$40$$

$$^{\ddagger} \quad 21 \times \$40$$

Therefore Revenue ÷ Costs = earning

$$\$1120 \div 900$$

$$\$840 \div 900$$

$$= \$1.24 \text{ per seat}$$

$$= \$0.93 \text{ per seat}$$

Even though demand and hence demand elasticities may be very dynamic, fares should not, however, be changed too often (eg. 3 or 4 times each year). Once every 1-2 years would be enough. For, everytime a fare is changed, further costs are involved eg: information costs, ticket printing, advertisement costs, staff training etc. Moreover travellers may become worried, upset or confused, and too much fare changing could end by making the public reluctant to travel by train anymore. That potential effect on MR revenues speaks for itself.

On the other hand, regular periodic study of market demand in order to measure both the public response towards fare, services and the effects of competition and public opinion generally is called for. Surveys have to be carried out systematically if one wants to obtain a really useful result. Given the variability of elasticity over time, another advantage of



regular surveys is the facility to average elasticity values both generally and for particular services at different times of the day, week, and season. This overcomes the drawback of time specific elasticity estimates and provides an on-going guideline to fare change desirability. Besides their variability over time, fare elasticity estimates are highly specific to segmented markets. While the expression “average elasticity” means an average for every segment, in fact it varies not only from one segment of the market to another, but within each segment from time to time eg. in the case of the Rakyat Express service, the fare elasticity in the last quarter of each year probably varies from one month to the next, maybe even from week to week. This problem may be overcome by taking running averages, (but omitting exceptional periods such as the festival, when elasticities will differ greatly from the norm) and then calculating a median value in order to determine fare changes for the following year.

Data from ticket sales indicate retrospectively only what the travelling public has done and this gives few clues as to what they might do in the future (except, perhaps, travelling back to see family and relatives during Hari Raya or other public holidays, especially within the fourth quarter of the year). Valid information about their travelling patterns and intentions, their willingness and ability to pay, their hopes for the future and expectations of MR services – all these can be gathered only from an opinion survey.

Since opinion itself is mutable according both to service and sample and from one time to another, it appears that regular monitoring by customer-orientated surveys is desirable. While comparison between precisely timed regular survey analyses could yield a more reliable indication of trend, there are also some advantages in conducting erratically timed surveys, providing always that a constant frequency of survey is maintained within a specific time period (eg. ten surveys in four years). Erratic surveys may catch variations in elasticity values that might be missed with regular surveys, and perhaps should form a secondary series to the main “control” surveys.



It is proposed then, that MR start to develop a demand-related range of rail services, and the fare for every type of ticket or service should change according to its demand elasticity. The latter may be calculated not only from opinion surveys (Stated Preference) but also from the statistical data of MR operations (ticket sales, passenger numbers, passenger km, passenger revenue etc.), all of which contribute vitally to fare policy and operations planning (and constitute Revealed Preference). A real basis for fare change does exist.

### **7.3 Meso-Economic considerations**

As a precondition to implementing the fare change exercise we need to assume that growth in national prosperity will continue in Malaysia together with stability in the politics of the country. For both these factors exert a great effect on income, employment, private transport ownership, transportation development, social interaction and so on. It is, in effect, a political economy.

Income will help determine the willingness and ability to pay for travel and other, possibly associated expenses eg. holidays. Employment will make the working age population more mobile, resulting in travel between small towns in rural areas and the main urban centres, and also in suburban commuting to and from work and lodgings, shops and leisure facilities. Savings will permit holidays, and consumption increase freight traffic.

Even under stable conditions of politics and national prosperity, the factors influencing demand – typified by human preferences – are always and inevitably changing. This reinforces the need for MR to change fares at least as frequently as once a year, quite unlike the present practice (only twice changed since 1956!).



Should in the unlikely event of positive values being found (ie. increased fares giving rise to increased, not decreased, demand-or the inverse) our study would need to examine which of many other identifiable factors had influenced that particular demand for rail travel: eg. changes in the perceived quality of service, or demand due to an effective promotional campaign. Positive elasticity values would seem to highlight the possibility of raising fares to the maximum level which the market will bear (taking both the state of competition and the amount which customers are able and willing to pay into full consideration). This positive elasticity happened to MR in their previous fare changes in 1985 (see table 5.1).

Once MR became a corporate body, then it can decide easily whether to carry out the proposed fare experiment. Thus, it needs to train personnel, especially clerical staff engaged in ticketing and in data collection. Their existing work will become both more useful and more interesting. The training should be short, simple to understand, and easy to carry into practice. Given that, responsibility could thereafter be delegated "down the line".

Once MR agrees to implement fare changes through the elasticity of demand approach suggested in this thesis, the whole MR organisation may tend to integrate and co-ordinate its work more purposefully. Just as in a private commercial company, MR personnel may then perceive that individual career prospects depend more closely than hitherto upon dynamic corporate performance in realising higher targets for revenue contributions. Impelled by a virtuous circle of shared motivation and reward, managers will then ensure closer liaison and co-operation between departments; for in order to meet these new objectives, organisational efficiency must improve at every level, with pride in the ability to provide services which meet public demand.



Since MR already deploy a large establishment of personnel only a marginal amount of its cost and of its existing resources need be budgeted and directed towards any continuous programme of experimentation and regular surveys/data collection.

A further development may be to measure demand elasticity in terms of service quality, which normally splits into waiting time, travelling time, seat availability, headway and transfers, (LAGO, et al 1981). Eventually MR may establish a system which will specialise in elasticity measurements – both fare and service quality elasticity – because this is one of the ways to measure or forecast market demand and it will help in their planning.

If fare and service elasticities are known according to particular market, the demand or revenue generated by a particular action or set of actions could be improved by manipulating both the fare and the service levels. If, for analytical purposes, the revenues generated by an improvement in service are assumed equal to the additional costs of providing that service and if the fare and service elasticities are not numerically equivalent, then travelling demand can be increased with no net effect on revenues by proper fare and service adjustments. Thus, when the service elasticity for a particular market is larger than the fare elasticity, MR should raise fares and use the revenues produced to finance service improvements. Conversely, if the fare elasticity is larger than the service elasticity, then fares should be decreased and the revenue loss covered by the cost savings of a simultaneous service reduction.

#### **7.4 Benefits from computer simulation**

In this study we have shown by way of illustration an example of computer simulation of fare changes, demand changes and their effects on revenue, using differing combinations of elasticity values (mid-point elasticity in particular) with various percentages of fare increase. This facility opens up to MR an on-going opportunity to select a revenue-



enhancing fare strategy from a large range of combinations of fare and elasticity values (eg. from -0.1, -0.2, -0.3 right up to -2.0 for both fare increases and fare reductions). Such computer simulations also enable results from surveys to be processed as they became available. Provided that regular monitoring is undertaken, a revised fare structure could be implemented periodically which would take full account of changes in public preferences.

A fare variation facility in the simulation of from 3% up to 15% enables MR to choose which combination is suitable, under the prevailing circumstances, to be applied to each service selected for experimentation. Only a limited series of ranges in elasticity values had been set out in the feasibility study proposal (cf. Table 6.3, Chapter 6), since this was intended merely as a demonstration. Once a proper simulation system is established, more extended and detailed calculations may readily be undertaken. From this exercise, utilising ranges of both fare elasticities and percentage fare changes, a better combination may be selected which should result in practice, in a worthwhile revenue increase.

This may well represent an innovative advance in current practice as applied by transport authorities and organisations in developed countries, and lead the field in developing and under-developed nations as well. Railway management thus possess a tool with great potential for devising future strategies which is also endowed with remarkable flexibility. MR has a unique opportunity to set a good precedent in this way for other transportation organisations.

Another immediate benefit may arise through better use of existing data bases already established in the MR system, for example those specific data such as passenger-Km, passenger-numbers, passenger-revenue and passenger flow according to ticket type and stations which until now are only kept on the files for record purposes.



This feasibility study suggests that, both during and after fare experimentation, careful attention ought to be given to updating records regularly. For from this basis, future demand could be guesstimated and the service offered could be adjusted in accordance with its costs and revenues. Moreover, an aim to utilise available resources more beneficially may also involve enhanced manpower productivity eg. ticket staff on board trains may be encouraged to deal with passengers in the third class wishing to move up into second class accomodations through payment of a few dollars fare supplement – helping to secure 80-90% seat occupancy will enable MR to collect valuable extra revenue.

Another strategy is to fill the train by encouraging certain groups of travellers like students and pensioners to take special discount fare offers in the off-peak season. By getting extra revenue without spending (because the seats and staff are already available) MR have the opportunity to increase or to maximise its contribution (revenue *minus* variable expenses is *equal to* contribution as explained in Chapter 4), thus increasing efficiency and profitability.

Since MR will be paying both survey expenses and fare/service elasticity experiment costs, it might be worthwhile to do a cost-benefit analysis to each series of experiments. No useful results can be obtained from anything that falls short of full implementation, and operating revenue may be damaged through half-hearted attempts. As systematic surveys become regularised, they can be expected to become easier and cheaper. The benefits may then become more apparent than may be the case at the initial stage. One has to envisage the medium to long-term effects of increasingly successful adaptations of fare and service to varying demand and to changing public preference.

These surveys will provide MR with a measure of the opinions and expectations of the travelling public. In Malaysia, this type of survey is practiced infrequently: only a few bus operators (including incidentally the National Bus Express Company – a semi-government-



owned agency) and Malaysian Airline system carry out such surveys as part of their market research programme. If MR were to adopt the suggested practice, it is held that then they will place themselves in a better position to fulfil public expectations concerning the service and also raise revenues incrementally.

When revenue contributions became more secure it should become easier to undertake longer range planning of future services involving not only their likely qualities, fare ranges and timetabling but capital investment in locomotives, rolling stock, signalling, station modernisation, etc. necessary to support an enhanced transport system. Information at present merely held on file could thus also contribute to determining both survival of MR and its winning an increased market share in future years. Before this can happen, MR needs to undertake a series of experiments to determine how useful such a strategy is proved to be, and thus what long-term benefits may accrue to both MR and the travelling public. This is the challenge that MR management should now consider.

### **7.5 MR management in the future**

It seems obviously necessary that MR reorientates its organisational objectives towards the market by means of survey research. In the past, the customer's opinion has never been properly taken into account by either MR or the government, but only the service suppliers' viewpoint. When, some years ago, MR enjoyed a monopoly in the supply of transportation services, maybe something could have been said in favour of this approach. Nowadays, however, MR is facing stiff competition, and has to change its approach, especially as the public, with its greater purchasing power, is much more alert to the alternatives available in the market.

It is not enough for MR simply to increase revenue without regard of additional variable costs incurred for those which may unduly reduce the final contribution. Greater emphasis



upon efficient internal contribution does not simply involve greater use of available resources, but also variable cost reduction and control wherever possible. Resources must progressively exceed variable costs on all retained services, so that these contributions can be used to cover MR's fixed costs. (In fact, some accountants take contributions to be quasi profit, since the fixed costs are seen as inevitable for continuation in business and have to be met whatever else occurs). The fare experimentation therefore should include the careful monitoring of variable costs alongside computation of additional revenues.

It is urgent for the whole of MR staff to realise how important for their own future and for that of their organisation it is to fully commit themselves to what they are doing, just as if they were in the private sector and not simply like a non-moneymaking Civil Service Department employee. For this to happen – actually MR do have capability and a sense of responsibility already but it is not highly developed – it will be necessary for their efforts to be fully recognised by higher authority. Payment and promotion by results becomes much more possible, and has a galvanising effect, when proper market research has revealed the effective opportunity.

Future adjustments involving raised national expectations of MR services may be made more confidently from research and an action learning approach. Once a good track record begins to become established, the whole process of survey, fare adjustment, contribution enhancement and improved staff rewards could become a self-sustaining virtuous cycle, or upward spiral. Of course, one can expect some mistakes to occur, and not all good intentions become translated at once into tangible success: but the general aim is clear enough. MR should realise at the outset how important it is to improve their financial provision practically through action research and learning. They should not indulge simply in “working papers” or just raise the plan “vocally” in meetings or seminars: the need is first and foremost for experimental action.



Drawing together the effort, commitment and responsibility of all employees, but particularly top and middle management and administrators, by means of the new approach outlined above will, it is hoped, increasingly tend to produce solutions to problems of improving MR financial position; not just or primarily on paper, but first and most importantly in the field of effective action appropriate to a new era, in which the elasticity of demand concept proves to be as useful in MR, or more so, than in other advanced railway systems.

### **7.6 Further tasks towards improvement**

Several other steps which MR might try are worth mentioning, although beyond the immediate scope of this study. Firstly, they might undertake an information and publicity campaign centred on the “unique selling points” of MR services – ie what MR can offer better or cheaper or more conveniently than other forms of public transportation. As already mentioned, competition now extends to private car usage as well as to other forms of public transportation, so the unique attractions of rail travel must be clarified and presented as reminders to the public. Consumer-orientated publicity represents a new step forward for MR.

Other than that, it should be noted that MR do not have enough promotional campaigns in order to inform their public(s) what is actually on offer from time to time. This point is proved by that answer in the survey which showed that more than 50 per cent of the sample did not remember when was the last time that they saw an advertisement relating to train services. MR lags far behind many other transport operators in this respect. Advertisements form an integral part of the fare experimentation exercise - people have to know in advance about the changes in order to appreciate them and make the best possible use of new services.



Moreover, the public appear prepared to pay for improved quality of service with which they can identify and feel a need. MR needs research to find which should be the priority improvement in service. MR should also pursue this point by further study, because “willingness to pay” does not necessarily mean “able to pay”, and vice versa. Provided MR consider this fact, it may win a larger market share in the future; even though to retrieve monopoly power status remains out of the question in any foreseeable future.

### **7.7 Conclusion**

Reorientation of MR organisational objectives towards market considerations and practices represents such a change that it could only work with full involvement of MR personnel who would themselves benefit from change. Increasing competition provides the spur to revised working under a long-term strategy plan: however no initiative can be taken without recovery of powers of decision-taking in the commercial matters. Change cannot come about unless MR is willing to change because it sees that survival and fulfilment of its objectives both depend on it.

The elasticity concept is well proved in other railway systems, mostly in advanced industrial economies, but requires special adaptation for conditions in Malaysia. The possibilities of practical application have been explored in detail through the pilot studies undertaken by the researcher. The way forward is through experimentation with fare changes based on estimates of elasticity values both for fares and quality of service. If the fare changes do occur sometime next year, according to MR’s present plan, actual elasticity measurement as can be done to reform the existing estimates for the full-scale experiment.

Once the level of demand and the state of public opinion in relation to MR’s existing and planned services have been fully reorganised, studied and researched, with decisions taken



to monitor changes on a regular basis, computer simulation offers invaluable assistance to management. It enables the future cost, revenue and contribution implications of a range of options of changes to be explored in advance of implementation. It also helps show how better utilisation of existing resources and services may assist through reductions in average cost.

It is important to monitor changing demand through regular and systematic opinion surveys and database update. For *strategic purposes* the specificity of individual estimates can be averaged out over several surveys to provide more general guidelines. Average here means overall average for every segment of the market, *not for specific operational* areas because at this level (operational level) every segment of the market need to be classified according to their own elasticity measurements.. This calculation is needed because previous experience shows the variability in elasticity values of other railway system services from one period to the next: a single specific estimate offers a poor guide to demand over a more extended time-span, and does not yield a reliable guideline for longer-term fare changes and their revenue contributions. One can, however, study the trend or the range of elasticity values in every market segment, taking both the average for each and, if needed, an overall average.

Demand-related rail services can make MR more competitive. Changes in the political economy could be accommodated in our system but acute general instability could not. Once established in MR, the system would self-perpetuate and improve, and personnel would coordinate under a shared objective. Long-term benefits would accrue to both MR and the travelling public.



## CHAPTER EIGHT

### CONCLUSIONS

#### 8.1 Introduction

Compared with European railway systems, that of Malaysia is relatively small in terms of its track length, number and type of services offered, and numbers of population able to travel by rail. Yet MR faces two major types of problems, one internal the other external. Internally, financial problems involving continuous operational losses predominate over problems of management, communication and productivity. Externally, the problem is one of confused statutory control, with a tendency for government to use railways as a 'political toy' at elections, but otherwise to minimise ongoing financial allocations for expanding railway services.

It seemed that there was no research yet undertaken by MR on how to increase revenue through effective fare structures; moreover, it was difficult to find actual figures of revenue, expenditures, assets and liabilities, due to the way financial statements are presented and to the time-lags involved. Figures may thus be wrongly interpreted or even manipulated according to ulterior objectives. Since no official market research has been undertaken (other than sporadic practical studies by the occasional college/university student, relegated to library shelves and kept there for no known purpose) there clearly existed both a need and a gap to be filled.

As outlined in the Introduction, several alternative policies are available to MR, but all of them involve greater commercial autonomy and it may not be possible to completely break with present constraints. However, this research has pioneered a low-risk, compromise approach achieved through undertaking a low-cost pilot survey of market demand as part of



an attempt to estimate the hitherto unexplored area of the fare elasticity of demand facing MR in its many segmented services.

It is hoped thereby to discover a discriminatory fare structure which will increase revenue contributions and reduce dependence on subsidies by the taxpayer. This can only be realistically achieved through a controlled series of selected fare change experiments. Computer simulations are envisaged which will clarify the options for each specific service.

## **8.2 Overall Conclusions**

Before the 1980's, MR faced a much more homogenous market demand because only ordinary train services for passengers existed. Introduction of express services and new coaches, together with growth of commuter services, have effectively segmented the market. The research undertaken in this thesis has attempted to identify both quantitative and qualitative dimensions of the current segmented market, and to indicate the threats posed by increased competition between forms of transportation. It outlines one possible method for MR to overcome its present handicap, and suggests a practical plan for real implementation at the earliest opportunity.

Whether a careful working of both RP and SP methods can result in a sufficiently accurate range of fare elasticity estimates for each service – so enabling MR to improve revenues without having to utilise additional resources - can only be proved by 'trial and error' and the evaluation of 'before and after' studies. How *valid* are the computer simulations can again only be tested by means of real-life experimentation.

However, it is also a judgemental matter, for adjustments made during the process of so-called action learning are basically derived from technical interpretation of results from data analysis and opinion surveys, each involving some degree of discrimination and



compromise. How *applicable* the outcomes are is largely some function of both transportation politics and commercial management of the MR organisation.

The model manner in which both RP and SP methods provide two central ranges of elasticity estimates for each type of service, and then comparisons are made with actual out turns in order to discover which method, at that precise juncture, yields the most accurate elasticity range, is clearly most important for future fare setting. Greater accuracy may be achieved at each successive round, of fare changes.

Earlier studies have largely remained coy and inexplicit about their actual workings. This thesis, by contrast, attempts to clarify and explain all its procedures; it provides 'rail-only' estimates for each service instead of 'aggregate' estimates for all forms of transportation.

Because there is room for error, and because SP involves an assumed value for the 'after' situation, ranges are utilised rather than exact or mean figures, for which no guarantee of accuracy is possible (eg. since 1940, the urban fare elasticity of demand fell strongly between -0.1 to -1.0, and for inter-urban in the range -0.3 to -0.8 (see Appendices H-1 and H-2).

However, decisions cannot be undertaken on the basis of research criteria or management attitudes alone: the travelling public as responding through the opinion surveys represents a prime source of objective intelligence which, granted a fair measure of accuracy in conducting the poll, can only be denied at the peril of eventual commercial collapse.

Threats posed by ever-increasing competition from alternative modes of transport should sharpen MR's resolve in this direction: services should be seen to be supplied because the demand for them exists sufficiently strongly to make them viable through the fares charged.



Promotion campaigns should be designed to match market profiles and exploit their opportunities.

Market-orientated activity would thus complement the cost-studies already undertaken and contribute significantly to rate-making procedure and expertise. Further classification and updating and refinement of MR statistics are required, with improved availability. Without further experience of fare changes, rate setters will have difficulty in finding 'the floor' :- the proposed experiment is specifically designed to assist them.

The pilot survey revealed that contrary to the experience in many advanced industrial economies - the majority of rail travellers in Malaysia are those making occasional long distance trips, rather than short distance commuters. The bulk of respondents were young to early middle-aged Malays visiting family and friends during holidays and/or for religious festivals. It is therefore their stated preferences which predominate in the analyses.

The indications are that this exercise would prove both valuable and useful to MR, enabling management to re-appraise its fare-setting methods; having also a motivational effect on MR personnel; and probably leading to an increased level of revenue contributions, which in turn will help ensure future independence in decision - making. It follows that the aim of increasing MR's share of the mass transportation market will become incorporated into its strategic policies. The 'grounded' field research undertaken in this study highlights the practical aspects of pursuing such a course.

The opinion survey in the 1987 pilot study carried out by the researcher illustrated her strong belief in the relevance of such an approach to MR commercial management. Another two surveys in 1990 supported the earlier findings of how the quality of service is more important than the fare while travellers decided to travel by train. It seems that when the service quality can be improved, there is no problem for fare to be increased too. Other



information obtained from MR Commercial Department confirmed both a segmented market and varying demand according to service type, timing and season. The importance of the 40Km commuter zone around big urban centres was also underlined by this research, as was the well-known peak travel times at various religious festival holidays. It became self-evident that varying types and intensities of travel demand represented special opportunities for MR to win and hold a bigger and more constant proportion of this somewhat unstable travelling public, and by giving due regard to fare elasticities, also to secure additional revenue contributions.

Certain problems did arise in the researcher's attempts to obtain valid and useful information from various sources. A serious communications gap between MR Departments was revealed, giving rise to serious losses of dated information. Neither did the Government Statistics Department possess updated data useful in making comparisons between growth of demand in both public and private transport. Other statistical data was also out-of-date, thus the sample survey analysis of this research provides a unique resource capable of much greater future development.

A small number of very limited and virtually meaningless works on the elasticity of demand concept are available in Britain as part of a scarce study literature; up to the 1988 cut-off point for on-line research, those studies which specified a value for the fare elasticity of demand did not explain either the purpose of the calculation (and therefore the variables selected as significant) or the method whereby the calculation was carried out (and therefore its possible relevance to the researcher). It is believed, in fact, that either many of the recent works on elasticity have not (yet) been published, or that their 'inner workings' are deliberately being withheld from disclosure: Goodwin's work in 1988 and articles in the January 1988 issue of *Journal of Transport Economics and Policy* (JTEP) remaining notable exceptions.



The researcher's first pilot survey was itself limited to the third quarter of 1987, while the other surveys were carried out in the first quarter of 1990 and apart from confirming which MR services were generally in high or in low demand at that time, could not be taken to represent the overall picture throughout that year. This is one of the reasons why during the experiment it is suggested to undertake three opinion surveys within one year, so that some cross-survey validation and trend determination may emerge.

Examination of elasticity as a concept and perusal of its methodology led to the conclusion that figures derived from a strict mathematical derivation from a formula (or equation) are virtually meaningless in practical terms. Whenever a *range* of values are given for each segment of market demand, then one can sub-divide the estimates in terms of whether the demand is elastic, inelastic or unit elastic, and this may be extremely useful in fare-setting. Smoothing the demand curve to diagnose a steadier trend may also prove useful in estimating future elasticities. The fare experimentation 'feasibility study' is intended to provide MR with initial practical experience so to re-inforce the learning process, and also to persuade MR to continue with market - oriented fare adjustments. This necessitates a thorough - going change in current MR attitudes.

A history of under-development characterizes MR in comparison with other forms of transportation in Malaysia. Trial introduction of novel forms of coach were seen to have an immediate effect on the popularity of rail travel. Fare elasticity of demand along particular routes can obviously be modified by improvements in the quality of services. From the study standpoint, existing services also display marked differences in the fare elasticity of demand. It seemed only rational to re-examine fare structures in both cases on a type of 'trial-and-error' basis, which is at least guided by elasticity estimates.

One has also to put the likely position if no action on the above lines is undertaken. If the government create too many bureaucratic obstacles or delay too long, the operating loss will



grow, MR management will become apathetic, and personnel demotivated : career prospects in MR may dwindle. Greater subsidies will be needed to keep railways in operation, and this means even greater dependence on ties with government, entailing even more regulations.

Freedom in pricing policy - making means MR ought to set prices that at least cover variable costs. The actual fare and thence the contribution made towards overheads then profits would depend on the elasticity of demand for that service. If government continues to insist that unprofitable services are maintained on the basis of PSO, then government should subsidise MR total losses wherever incurred, and not just 50 per cent of PSO losses as at present. Otherwise market responses become distorted, and with them the pattern of fare elasticities on all other services, especially those inter-connected.

If the proposed twelve months period of fare experimentation, (intended to assess the real usefulness, constraints and risks of the elasticity approach) results in an unacceptable negative gap between revenue and costs (the later exceeding the former) one could then deduce that:

1. the initial estimates put forward for the experiment lay too far outside the real range at that time (a slim possibility),  
**and/or**
2. although estimates lie within the range, other factors such as service quality, promotional activities, and monitoring of costs are those in most urgent need of attention.

In fact, the simulation reveals that the revenue lies between M\$29.340 mil to M\$30.771 mil and the cost of the experiment will take about M\$30-M\$35,000 which is 0.1-0.12% of total estimated revenue.



### 8.3 Pointers to Future Applications

Provided that the trends revealed from imperfect information 1982-1987 and the demand forecast for 1990 remain unchanged, it seems evident that passenger traffic will play an ever - increasing role in MR's total market. In this light, it is suggested that management extend express services, night and mail services to the East Coast line and other branch lines in the same way as already instituted along the West Coast. At the same time, they could bring in a fare structure discriminated according to the elasticity levels of those market segments.

Another plan (so far abortive) is that first discussed in 1985, including proposals for a new East-West link across the Titiwangsa mountains, and building a second track alongside existing main lines. MR is not yet a fully integrated system, but eventual completion would obviously open up travel possibilities and alter fare elasticities of demand in certain regions. The new development, ie. constructing the second track from Rawang to Seremban and Sentul to Port Klang, definitely will improve MR revenue through commuting service.

Assuming that the initial experiment proves at least partially successful, fare changes could gradually be extended to other services until the whole MR system is involved.

Other desirable changes within MR indicated by this research include:

1. Cost allocation to be reclassified according to the type of service to which it relates. This would allow MR to set fares by Km distance for all types of service and also enable them to calculate earnings for every service, which later could be related to their productivity level.



2. Measuring the quantity of accommodation on trains demanded according to the travel distances involved and not just by simple counts of passenger numbers at terminals would also make MR statistics available in a form more easily applied to measuring elasticities of demand. Although passenger - Km statistics exist in MR, they are too complicated to be useful.
3. Promotional activities might be stepped up in order to make the public more alert and better informed, eg. through TV advertising. Another avenue could be closer co-operation with Malaysian Tourist Development Corporation (TDC) with the aim of encouraging more home-based as well as international tourists to travel by train and so discover the hidden beauty of Malaysia, coast and interior.
4. Further and more effective work could also be undertaken to access quantitative information about the effects of other causal variables upon the fare-set and particularly how these same variables alter demand.
5. Another extension of research might be to measure the tariff (rate) elasticity of demand in the freight market of MR, deliberately ignored in this thesis but also offering strong potential for revenue contributions.
6. Ultimately, the application of the elasticity concept might be extended to other types of public transportation, so giving rise to comparative studies and assisting any future policy for national planning in transportation, housing, industry and so on - or alternatively, one for improving co-ordination in the market economy through enhanced efficiency, independence and keen rivalry between organisations managed on a market - oriented and competitive basis.



The current situation notwithstanding is one where MR need to gain practical experience through an action - learning process. By using both RP and SP methods, they could attempt to manipulate the 'real-life' system and monitor that. Conclusions drawn from one set of changes would then be available to help formulate the next strategy. MR would thus generate a timely opportunity to gradually transform itself from a dinosaur into a much better adapted and more vigorous organisation than it evidently is at present. It would appear unreasonable to refuse the concept of the fare elasticity of demand a prime opportunity to be applied in the MR transportation system, especially since this research thesis has shown that it could work in a developing country as it has done elsewhere in advanced industrial nations.

## LIST OF REFERENCES

- ABEL DJ, START KP, MURRY CR, DENOULIN YM (1981) – A routeing and scheduling problem for a rail system – a case study. *Journal of Operational Research Society*, vol. 32, September, pp 767-774.
- AHMAD BADRI (DATO') (1986) – Rail transportation in Malaysia: challenges and prospects – MR GM Office, April, Kuala Lumpur.
- ARDO, Australian Railway Research and Development (1980) – Costing and accounting practices in Australian Railways, Report N° 80/30, June 1980.
- AREVALO AJ (1982) – An evaluation methodology for developing countries to improve decision making in the transportation sector, PhD 1982, The Pennsylvania State University, USA.
- ASSAD AA (1980) – Models for rail transportation. *Transport Research A*, vol. 14A, pp205-220.
- BAILEY KD (1982) – Methods of social research - The Free Press, New York, 2nd Edition.
- BAMFORD CG, CARRICK RJ, MACDONALD R (1984) – Public transport surveys: a new effective technique of data collection. *Traffic Engineering and Control*, June, pp318-319.
- BEER S (1985) – Diagnosing the system for the organisation, John Wiley and Sons Limited, Chichester, England.
- BEESLEY ME, KETTLE PB (1985) – Improving railway financial performance. Gower, Vermont, USA.
- BEESLEY ME, KETTLE PB (1986) – Devising business strategy for railways – *Transportation* 13 Number 1, pp53-83.
- BEGG D, FISCHER S, DORNBUSCH R (1987) – Economics – 2nd Ed. McGraw Hill BLC Co., New York.
- BELL GJ, BLACKLEDGE DA, BOWEN P (1983) – The economics and planning of transport, Heinemann, London.
- BELL GJ, BOWEN P, FAWCETT P (1984) – The business of transport, Macdonald and Evans Limited, Plymouth, England.
- BLY PH (1976) – The effect of fares on bus patronage - TRRL, LR 733, Crowthorne.
- BLY PH, OLDFIELD RH (1985) – Relationship between public transport subsidies and fares, service, costs and productivity. Research report 24, TRRL, Crowthorne, England.
- BONBRIGHT JC (1961) – Principles of public utility rates. Columbia University Press, NY.
- BONSAL P (1983) – New survey methods in transport. 2nd International Conference, Hungerford Hill, NSW Australia September, VNU Science Press, Australia.



- BORTS GH (1960) – The estimation of rail cost functions. *Econometrica*, Vol. 28, N° 1, January, pp108-131.
- BOYER KD (1981) – Equalising discrimination and cartel pricing in transport rate regulation. *Journal of Political Economy*, 1981, vol. 89, N° 2 pp 270-286.
- BRADLEY M (1988) – Realism and adaptation in designing hypothetical travel choice concepts, *Journal of Transport Economics and Policy (JTEP)*, Vol. 22, N° 1, January, pp121-137.
- BRADLEY M, GROSVENOR T, BOUMA A (1988) – An application of computer based stated preference to study mode-switching in the Netherlands. Seminar D, PTRC, pp307-319.
- BRAEUTIGAM RR, DAUGHETY AF, JUNQUIST MA (1984) – A firm specific analysis of economies of density in the US railroad industry. *The Journal of Industrial Economics*, vol. 33, September, pp3-20.
- BRITISH RAIL and UNIVERSITY OF LEEDS (1978) – A comparative study of European Rail performance – University of Leeds.
- BRITISH RAIL BOARD (1973) – Pricing policy and profitability assessment in railways. Unpublished report, London.
- BRIX VH (1984) – Cybernetics in management: action learning analysed by control theory – *Industrial Management Data System*, March-April, pp 25-31.
- BROG W, MEYER N (1978) – From price elasticity to price susceptibility: A reality oriented model for influencing transportation fees according to demand. Conference on public transport system in urban areas. Gothenburg, Sweden
- BUTTON KJ (1982) – Transport economics, Heinemann, London.
- BUTTON KJ (ed.) (1985) – International railway economics, Gower, Vermont, USA.
- CALL ST, HOLAHAN WL (1980) – Microeconomics, Waldsworth Inc., California.
- CAWES DW, CHRISTENSEN LR, SWANSON JA (1981) – Productivity growth, scale economies, and capacity utilisation in US railroads, 1955 – 74. *The American Economic Review*, vol. 71(5), December.
- CHAN Y, OU FL (1978) – Tabulating demand elasticities for urban travel forecasting – *Transport Research Record* 673, pp40-46.
- CHATTERJEE A, WEGMANN FJ, McADAMS MA (1983) – Non commitment bias in public opinion on transit usage. *Transportation* Vol II, N° 4, pp347-360.
- COBBETT DJ (1982) – Management of firms to satisfy transport needs – Railway. International Symposium on theory and practice transport economics, Madrid, November .
- COOTER R, TOPAKIAN G (1980) – Political economy of a public corporation – pricing objectives of BART. *Journal of Public Economics*, Vol. 13 (3), June, pp299-318.
- COUTURE MR, DOOLEY T (1981) – Analysing traveller attitudes to resolve intended and actual use of a new transit service. *Transport Research Record*, volume 184, pp27-33.



- CUNNINGHAM MT, KETTLEWOOD K (1976) – The influence of the image of suppliers on buyer behaviour in the freight transport market – *International Journal of Physical Distribution* (UK), Vol. 5, N° 5 pp 238-271.
- CURTIN JF, et al (1968) - Effect of fares on transit riding – Highway Research Record, Washington, pp 8-20.
- DALY AJ (1973) - Elasticity of demand for public transport - Symposium on public transport fare structure, SR 37UC, November, TRRL, Crowthorne.
- DAVIES J, HUGHES S (1975) - Pricing in practice - Heinemann Educational Books Ltd, London.
- DHEERASINGHE KG (1982) – An evaluation of BR's fare policy - MA Thesis, ITS, University of Leeds.
- DOE BS (1986) – BR fares: the evaluation of selective pricing – *Modern Railways*, September, pp484-485.
- DOMENNICHI TA, McFADDEN D (1975) – Urban travel demand – North-Holland. Amsterdam.
- DOMINIC S (1974) – Microeconomic theory. McGraw-Hill Inc., New York.
- ECMT (1980) - Traffic policies for urban transportation (other than road pricing). Report of 46 Roundtable on transport economics. Economic Research Centre, Paris.
- ECMT (1982) - 9th International Symposium on theory and practice in transport economics. Madrid, November.
- ECOSOMETRICS, INC. (1980) – Patronage impacts of changes in transit fares and services, UMTA, US Department of Transportation.
- EDGELY R (1980) - Social benefit is not a quantity that can be objectively measured. *Public Finance and Accountancy*, September, pp 15-17.
- ELSE PK (1985) - Optimal pricing and subsidies for scheduled transport services. *Journal of Transport Economics and Policy (JTEP)*. Vol 29, No 3, September, pp 263-279.
- FAWZI BASRI MA (1985) – Railway history in Malaysia – Malayan Railway, Kuala Lumpur.
- FONTANELLA G (1983) - The costs, revenues and deficit of the Italian State Railways' goods traffic. *Review of the Economic Conditions, Italy*, October, pp 431-456.
- FOSTER CD (1975) - The transport problem. Croom Helm. London, 2nd revised edition.
- FOWKES AS, NASH CA, WHITING AE (1985) - Understanding trends in intercity rail traffic in Great Britain. *Transportation Planning and Technology*, Vol 10, pp 65-80.
- FOWKES AS, NASH CA, SANDERSON I (1986) – Management information on rail passenger traffic: Management needs and ways of satisfying them, Working paper 217, ITS, University of Leeds.



- FOWLER D (1979) – Financial analysis of railway operations. *The Chartered Institute of Transport Journal*, Vol. 38, N° 19, pp286.
- FOWLER D (1981) - Setting rates on the right lines. *Accountancy Age (UK)*, 23 January, pp14-15.
- FREEMAN III AM (1983) – Intermediate microeconomics analysis. Harper & Row Publisher, New York.
- GAND H (1984) - "Bottom line" business standards versus public service obligations : the case of the German Federal Railway. *Transportation Research A*, Vol 10A, pp 237-247.
- GARBADE KD, SOSS NM (1976) – Fare policies for mass transit deficit control: analysis by optimisation, *Transportation Research*, Vol. 10, pp237-247.
- GELTNER D (1985) - Transport and energy in developing countries. *Energy Policy*, Vol 13:4, August, pp 340-344.
- GEVEKE K (1983) – How innovative marketing brought the passengers back, *Railway Gazette International*, February, Vol. 139, pp101-103.
- GIBSON JG (1981) - A rational alternative fare structure for BR's London and South East Commuter passengers. *JTEP*, Vol 15(3), September, pp 269-276.
- GLAISTER S and COLLINGS JS (1978) – Maximisation of passenger miles in theory and practice, *JTEP*, Vol. 12, N° 3, September, pp304-321.
- GLAISTER S (1981) – Fundamentals of Transport Economics, Basil Blackwell, Oxford.
- GLAISTER S (1983) – Some characteristics of rail commuter demand. *JTEP*, Vol. 17(2), May, pp 115-132.
- GLENDINNING, (1979) – Better railway costing, *Management Accounting*, July/August, pp22-24.
- GOLOB TF, CANTY, ET, GUSTAFSON RL, VITT JE (1972) – An analysis of consumer preferences for public transportation system, *Transportation Research*, Vol. 6, pp81-102.
- GOODWIN PB, WILLIAMS HCWL (1985) – Public Transport demand models and elasticity measures: an overview of recent British Experience – *Transportation Research B*, Vol. 19B, N° 3, pp253-259.
- GOODWIN PB (1988) - Evidence on car and public transport demand elasticities 1980-1988. Oxford University Transport Studies Unit, June.
- GREEN PE, SRINIVASAN V (1978) – Conjoint Analysis in Consumer Research, Issues and Outlook. *Journal of Consumer Research*, volume 5, pp103-123.
- GREEN PE, TULL DS, ALBAUM G (1989) – Research for marketing decision. Prentice-Hall Inc., New York.
- GREY A (1975) – Public transport fares and the public interest - *Town Planning Review*, Vol. 46, N° 3, July, pp 295.



- GREY A (1975) – Urban fare policy, Saxon House, Hants, England.
- GRILICHES Z (1972) – Cost allocation in rail road regulation, *The Bell Journal of Economics and Management Science*, Vol. 3, N° 1, pp26-41.
- GUTNECHT R (1973) - Alternative fares systems. Paper 2 : SR37UC, Symposium on public transport fare structures. November, TTRL, Crowthorne.
- GWILLIAM KM (1964) – Transport and public policy, George Allen and Unwin, London.
- GWILLIAM KM, MACKIE PJ (1975) – Economics and transport policy, Allen and Unwin, London.
- HAOINVILLE G, JOHNSON E (1972) - Commuter preference : summary report. SCPR, Institute for Survey Research, July, England.
- HAOINVILLE G, JOWELL R (1978) - Survey research practice - Heinemann Educational Books, London.
- HARBESON RW (1953) – Cost findings in rail transportation: some lessons from America experience. *The Transport Communication Review*, Vol. 6, Oct-Dec, N° 4, pp28.
- HARPER DW (1966) – Price policy and procedure, Harcourt, Brace & World, Inc., New York.
- HARRIS J, WILLIAM G (1980) - Corporate Management and financial planning - The BR experience. Granada Publishing, England.
- HARTLEY TM (1980) – The influence of peaks in demand on the costs of operating up rail services. Institute of Transport Studies, University of Leeds, PhD thesis, August.
- HEDGES B, PRESCOTT-CLARKE P (1974) - Fares elasticity experiment, SCPR, Institute for Survey Research, England, December.
- HENSHER DA, BULLOCK RG (1979) – Price elasticities of commuter mode choice: Effect of a 20% rail fare reduction – *Transportation Research A*, Vol. 13a pp193-202.
- HENSHER DA, BROTHIE J, GUNN H (1989) – A methodology for investigating the passenger demand for high speed rail. Working paper 51, Transport Research Centre, MacQuarie University.
- HOPE KR (1982) - Improving public enterprise management in developing countries. *Journal of General Management*, Vol 7, No 3, Spring, pp 72-85.
- HOVELL PJ, JONES WH (1975) - Some organisational problems facing urban passenger transport marketing. *European Journal of Marketing*, Vol 9(2), pp 117-28.
- HUGHES PC (1980). Fare elasticity of suburban rail travel – TRRL SR614, Crowthorne, England.
- IBRD. International Development Association, – (1974) – Railway traffic costing, report number 472, April.



- IEA (1967) - Essays in theory and practice of pricing - IEA Ltd, USA.
- INT. UNION OF RAILWAYS AND JAPANESE NATIONAL RAILWAY (1970) - Third international symposium on railway cybernetics. Proceedings, Tokyo, April.
- ISAAC D (1985) - British Rail's late departure. *Management Today*, February, pp 43-51, 101, 104.
- JACOBS LR (1973) - Railway costing. Malayan Railway, February, Kuala Lumpur.
- JAPAN INTERNATIONAL COOPERATION AGENCY (JICA) (1985) - Malaysia - Feasibility study on the new East-West railway project and the West-Coast railway project. Unpublished Report, Government of Malaysia, Kuala Lumpur.
- JONES IS, NICHOLS AJ (1983) - Demand for Intercity rail travel. *JTEP*, Vol. 17(2), May 1983, pp133-153.
- JANSSON JO, CARDEBRING P (1989) - Swedish Railway Policy 1979-88. *JTEP*, Vol. 23(3), September 1989, pp329-337.
- KAHN AE (1970) - The economics of regulation : Principles and Institution. Vol 1, John Wiley and Sons Inc., New York.
- KANAFANI A (1983) - Transportation demand analysis. McGraw-Hill Book Company, New York.
- KANEMOTO Y (1984) - Pricing and investment policies in a system of competitive commuter railways. *Review of Economic Studies*, Vol L1(4), pp 665-681.
- KEMP MA (1973) - Reduced fare and fare free urban transit services - some case studies - paper 4 in TRRL SR37UC, Crowthorne.
- KEMP MA (1973) - Some evidence of transit demand elasticities - *Transportation*, Vol. 2, (1), April, pp25-51.
- KIMBER DC (1972) - The measurement of price elasticity on long distance rail services - MSc Thesis Polytechnic of Central London, December.
- KINNEAR TC, TAYLOR JR (1979) - Marketing research, an applied approach. McGraw-Hill, Kogakusha, International Student Edition.
- KINNUNEN RM, JANELL PA (1982) - Management Control in the Railroad Industry. *Tabs Transport Journal* 22 : Fall 82, pp 4-10.
- KITE P (1982) - Options in transport management. *Management Today*, April 1982, pp 82, 84, 86, 88, 91.
- KNEAFSEY JT (1975) - Transportation economic analysis - DC Heath, Lexington (Mass.).
- KOLSEN HM (1968) - The economics and control of road-rail competition. Sydney University Press, Australia.
- KRAFT G, WOHL M (1967) - New directions for passenger demand analysis and forecasting. *Transport Research*, Vol 1, pp205-230.



- KROES EP, SHELDON RJ, BESWICK M (1986) – Stated preference microsimulation models from qualitative inputs to estimate market shares in intercity travel – 39th ESOMAR Congress, Monte Carlo, September, pp125-135.
- KROES EP, SHELDON RJ, BESWICK M (1988) – Stated Preference methods: Introduction – *JTEP*, Vol. 22(1) January, pp11-25.
- LABICH K (1985) - A strange way to run a railroad - Santa Fe Southern Pacific Corporation. *Fortune*, January 21, Voll III : 2, pp 30-32, 34-35.
- LAGO AM, MAYWORM PD, MCENROE JM (1981) – Ridership response to changes in transit services – *Transport Research Record* 818, pp13-19.
- LAGO AM, MAYWORM PD, MCENROE JM (1981) – Transit Ridership Responsiveness to fare changes – *Traffic Quarterly*, Vol. 35, No. 1, January pp117-142.
- LEINBACH TR (1975) - Transportation and the development of Malaya. *Annals of Association of American Geographers*, Vol 65, No 2, June, pp262-267.
- LIM HK (1978) - The evolution of the urban systems in Malaya. University of Malaya Publisher, Kuala Lumpur.
- LOUVIERE JJ (1988) - Conjoint analysis modelling of stated preferences - *JTEP*, Vol. 22, N° 1, January, pp93-119.
- LOUVIERE JJ, HENLEY DH, WOODWORTH G, MEYER RJ (1981) - Laboratory simulation versus revealed preference methods for estimating travel demand models - *Transportation Research Record* 794, pp42-51.
- LOWE D (1979) - Costing and pricing goods vehicles operations. Kogan Page Ltd, London, Revised Edition.
- MACKETT RL (1980) - The impact of rail fare increases on locational behaviour. ITS, University of Leeds, Working paper N° 127.
- MALAYAN RAILWAY (1970) – Cost system. Unpublished Report. MR Financial Department, Kuala Lumpur.
- MALAYAN RAILWAY (1976) – Tariff Book N° 12 – Government Printing, Kuala Lumpur.
- MALAYAN RAILWAY (1980) – Tariffs. Unpublished reference paper, MR Commercial Department, Kuala Lumpur.
- MALAYAN RAILWAY (1982 to 1986) – Annual report – MR GM Office, Kuala Lumpur.
- MALAYAN RAILWAY (1986) – Report on strategy and plan to improve financial position of MR, Unpublished, GM Office, MR, Kuala Lumpur.
- MALAYAN RAILWAY (1987) – Costing system and costing manual, Volume 1, Unpublished Report, Canadian Pacific Consulting Services Limited, Kuala Lumpur.
- MALAYSIAN GOVERNMENT (1986) – Fifth Malaysian Plan - Government Printing, Kuala Lumpur.



- MALAYSIAN GOVERNMENT – Various mid-term Review of the Malaysia Plan, First Plan 1966-1970, Second Plan 1971-1975, Third Plan 1976-1980, Fourth Plan 1981-1985, Government Printing, Kuala Lumpur.
- MASSACHUSETT INSTITUTE OF TECHNOLOGY (1948) – Transit riding, revenues and fare structures – American Transit Association, March, New York.
- MANSFIELD E (ed.) (1971) – Some implications of marginal cost pricing for public utilities. WW Norton and Co. Inc., New York.
- MARKS P, FOWKES AS (1986) - Stated preference experiments concerning long-distance business travel in Great Britain. ITS, University of Leeds, January, Working Paper N° 219.
- MARSH R (RT HON.) (1971) – Government and Industry, *Co. Partnership* (UK), January, pp7-13.
- MASRI A (1981) - MR - The need for a second railway track. Proceedings, Transport Symposium, Kuala Lumpur.
- McGEEHAN H (1984) – Forecasting the demand for inter-urban rail travel in Ireland. *JTEP*, Vol. 18, September, pp275-291.
- MILNE AM, LAIGHT JC (1963) – The economics of inland transport, Pitman, London.
- MINTZBERG H (1983) - Structure in fives, designing effective organizations. Prentice-Hall, Inc., Englewood Cliffs, London.
- MITCHELL DA (1974) – Study of passenger fares of MR – Unpublished paper, Malayan Railway, Kuala Lumpur.
- MITCHELL J (1978) – Price determination and prices policy. George Allen and Unwin Limited, London.
- MORELLET O (1986) – A traffic forecasting experiment conducted jointly by four countries. The study of high speed train links between Paris, Brussels, Cologne and Amsterdam. September, TRRL Crowthorne, England.
- MOSER CA, KALTON G (1979) - Survey methods in social investigations - Heinemann Educational Books, London, 2nd Edition.
- MULVEY FP (1979) - Amtrak : A cost-effectiveness analysis - *Transport Research A*, Vol. 13A, pp 329-334.
- MVA Consultancy (1987) - Value of Travel time savings. Policy Journals, Newbury, Berkshire.
- MWASE N (1987) - Railway pricing in developing countries. *JTEP*, Vol 21, No 2, May, pp189-217.
- NAIDU G (1972) – Rail and road transport in West Malaysia - B Litt Thesis, University of Oxford.
- NAIDU G (1976) - Some problems of the Malayan Railways - an article in Focus on Transportation Resc. Toh. (Ed). The Chartered Institute of Transport (Singapore Div), Singapore.



- NASH CA (1981) - Government policy and rail transport in Western Europe. *Transport Reviews*, Vol 1, N° 3, pp 225-250.
- NASH CA (1982) – Economics of Public Transport – Longman, London.
- NASH CA (1982) – A rational alternative fare structure for BR's London and South-East Commuter Passengers, A Comment *JTEP*, Vol 16(1), January, pp95-99.
- NASH CA (1985) - Paying subsidy to British Rail : how to get value for money. *Public Money*, January, pp 35-40.
- NATHAN RR, ASSOC. INC. (1974) – Transport development in Malaysia – Vol 1 and Annex C, Government of Malaysia, Kuala Lumpur.
- NELSON JE (ed) (1964) - Marginal cost pricing in practice. Prentice-Hall, Inc., New York.
- NORTON HS (1971) - Modern Transportation Economics. Charles E Merrill Publishing Co., Columbus (Ohio), 2nd Edition.
- OECD Scientific Expert Group (1984) Co-ordinated Urban Transport Pricing – Road Transport Research, England, pp52-55.
- OLDFIELD RH (1974) – Elasticity of demand for travel. SR 116, TRRL, Crowthorne.
- OLDFIELD RH, TYLER E (1981) - The elasticity of medium distance rail travel. Report 993 TRRL, Crowthorne.
- PARODY TE, BRAND D (1979) - Forecasting demand and revenue for transit prepaid passenger and fare alternatives. *Transport Research Record*, 719, pp 35-41.
- PEAT MARWICK, MITCHEL & CO. (1977) – Public transportation fare policy - US Dept. of Transportation, May.
- PEDLER M (ed) (1983) – Action learning in practice, Gower, Hants, England.
- POOL E (1962) – Costs: A tool for railroad management. Simmon Boardman Publishing Corp. New York.
- PROCEEDINGS OF SEMINAR (1982) – Management of firms to satisfy transport needs. 9th International Symposium on theory and practice in transport economics, Madrid, 2-4 November.
- PROCEEDINGS OF SEMINAR (1986) – Transportation planning method – Vol. X p282, PTRC Summer Annual Meeting – PTRC Education and Research Services Limited, England.
- PROCEEDINGS OF SEMINAR (1987) – Urban transportation, The SEATAC workshop cum seminar, October, Kuala Lumpur.
- PRYKE R, DODGSON J (1975) - The rail problem. Martin Robertson and Co Ltd, London.
- PUCHER J, ROTHENBERG J (1979) – Potential of pricing solution for urban transportation problems: An empirical assessment. *Transport Research Record* 731, pp19-29.



- QUARMBY DA (1974) - Effect of alternative fares system on operational efficiency : British Experience TRRL Report SR 37, TRRL, Crowthorne.
- Railway Gazette International* (1982) - Asean profile. July, pp 531-538.
- RAINVILLE Jr WS (1948) – Transit riding, revenues and fare structures, American Transit Association, New York.
- REID RB (1984) - The link between revenue and resources. *Railway Gazette International*, Vol 140, pp 258.
- REVANS RW (1982) - The origin and growth of Action Learning - Student literature, Lund, Sweden, pp95-110.
- RICKARD JM (1986) - Modelling the factors influencing long-distance rail passenger trip rates in Great Britain. PhD thesis, ITS, University of Leeds.
- RICKARD JM (1988) - Factors influencing long-distance rail passenger trip rates in Great Britain. *JTEP*, May, pp 209-233.
- RIMMER PJ (1986) - Rikisha to rapid transit urban public transport system and policy in South East Asia. Pergamon Press, Australia.
- SEGAL MN (1982) – Reliability of conjoint analysis: contrasting data collection procedure. *Journal of Marketing Research*, Vol. 19, pp139-43.
- SELECT COMMITTEE ON TRANSPORT. Second Report (1982), Session 1981-82. Main line railway electrification HC 317-I, HMSO.
- SHARP C, JENNINGS T (1976) - Transport and the environment. Leicester University Press.
- SHELDON RJ, STEER JK (1982) – The use of conjoint analysis in Transport Research. Paper presented to the 1982 PTRC Summer Annual Meeting, Warwick.
- SHELDON R, MOELLER J, ANDERSEN PB (1986) – Marketing DSB rail services using a stated preference approach. Seminar M, PTRC, pp263-270.
- SIDA (Swedish International Development Association) (1985) – Zimbabwe National Transport Study. SIDA, Stockholm - On behalf of Zimbabwe Government, Main volume, pp71-73.
- SIEW KW (1981) – Marketing strategy for Malayan Railway “1980 – 1990”, Postgraduate Diploma Dissertation, Polytechnic of Central London.
- SINGH S (1983) – The scope for increased capacity and higher speeds on Malayan Railway, MSc project paper, Polytechnic of Central London.
- SMITH MG and MCINTOSH PT (1973) – Fares elasticity: Interpretation and estimation - paper 3. SR 37UC, TRLL, Crowthorne.
- STANFFER T and NAVARO P (1981) – A critique of conventional utility rate-making methodologies – *Public Utilities Fortnightly*, 26 February, pp 25-31.
- STENASON WJ, and BANDEEN RA (1965) – Transportation costs and their implication: An empirical study of railway costs in Canada, In: *Transportation Economics*, National Bureau of Economic Research, New York, pp121-138.



- STEVENSON DG, GEORGIADIS G (1979) - Operational research and corporate planning in railway management. *Journal of OR Society*, Vol 30, October, pp 849-859.
- TAPLIN JHE (1980) - A coherence approach to estimate of price elasticities in the vacation travel market - *JTEP* 14(1), January, pp 19-35.
- TAPLIN JHE (1982) - Inferring ordinary elasticities from choice or mode-split elasticities - *JTEP* 16(1), January, pp55-63.
- TAYLOR LK (1974) - Management of Change : A railway in Australia. *Industrial and Commercial Training*, Vol 6, June, pp 285.
- THEIL H (1966) - Applied Economic Forecasting. Vol 4, North-Holland Publishing Co. Amsterdam.
- THOMPSON D (1974) - Structures of railway costs, *Accountancy*. May, pp33-42.
- TRANSPORT STUDY GROUP (1981) - Railways in 3rd World : A comparative study of Malaysia, Thailand and the Philippines. Working Paper Series 11, Polytechnic of Central London.
- TROTTER SD (1985) - The price-discriminating public enterprise with special reference to BR, *JTEP*, Vol. 19 N° 1, January, pp41-64.
- TRRL (1980) - The demand for public transport collaborative study of the factors affecting public transport patronage - SR413 TRRL, Crowthorne.
- TYE WB (1985) - Rate base and rate of return methodologies for determining reasonable rates for captive rail traffic. *Transp. Research A*, Vol 20A, No 1 1985, pp 1-14.
- VAMFEW C (1987) - Concessionary bus passes : A survey of users. Research and intelligence unit CCRI, Cleveland County Council, Middlesbrough.
- VAN DER HOORN AIJM et al (1984) - Mode choice and mode captivity in inter-local commuting : Two Dutch Studies on modal split in congested transportation corridors. *Transp. Policy Decision Making*, N° 2, pp373-388.
- VIA - Canadian Pacific Railway Passenger Service (Nov. 1984) - Marketing, International Report, Canada.
- VICTOR MORGAN E (1974) - Pricing investment decisions and subsidies in transport - *Manchester School*, September, pp240-258.
- WARDMEN M (1988) - A comparison of revealed preference and stated preference models of travel behaviour, *JTEP*, Vol. 22, N° 1, January, pp71-90.
- WATERS II WG, UYENO DH, KEAST TG (1982) - Evaluation of railroad operation and financing. *OMEGA*, Vol. 10 No 3, pp 279-291.
- WATERS II WG, WOODLAND AD (1984) - Econometric analysis and railway costing. North Oxford Academic Publishing Co. Ltd.
- WATSON DS (1968) - Price theory and its uses. Houghton-Mifflin, Boston, 2nd Edition.



- WATSON GI (1978) – Public transport passenger surveys. *Traffic Engineerng and Control*, June, pp 268-72.
- WEBB MG (1976) - Pricing policies for public enterprises. The Macmillan Press Ltd., London.
- WELTY G (1983) - Productivity improvement : it can be had and the time to go for it is now, not when its too late - *Railway Age*, 184, pp16.
- WHITE PR (1981) – Recent developments in the pricing of local public transport services - *Transport Reviews* , Vol. 1, N° 1, pp127-150.
- WHITE PR (1983) – Further developments in the pricing of local public transport. *Transport Reviews*, Vol. 3, N° 4, pp329-340.
- WHITE PR (1983) - Problems of freight transport by railways in developing countries. TSG, Polytechnic of Central London.
- WHITE PR (1984) – User response to price changes application of the threshold concept. *Transport Review* 4, N° 4, pp367-386.
- WHITE PR (1986) - Public transport, its planning, management and operation, Hutchinson, London, 2nd edition.
- WILLIAMS G, SELLERS P (1983) - Planning for British Rail. *Public Finance and Accountancy*, August 1983, pp 23-26.
- WILSON GW (1962) - Essays on unsettled questions in the economics of transportation. Indiana Business, Report N° 42.
- WOOD WR (1983) - A robust model for railroad costing. *Transportation Journal*, Winter, pp 47-60.

Map of Peninsular Malaysia showing international and proposed boundaries by 1980, and roads built after 1980.

**REFERENCE:**

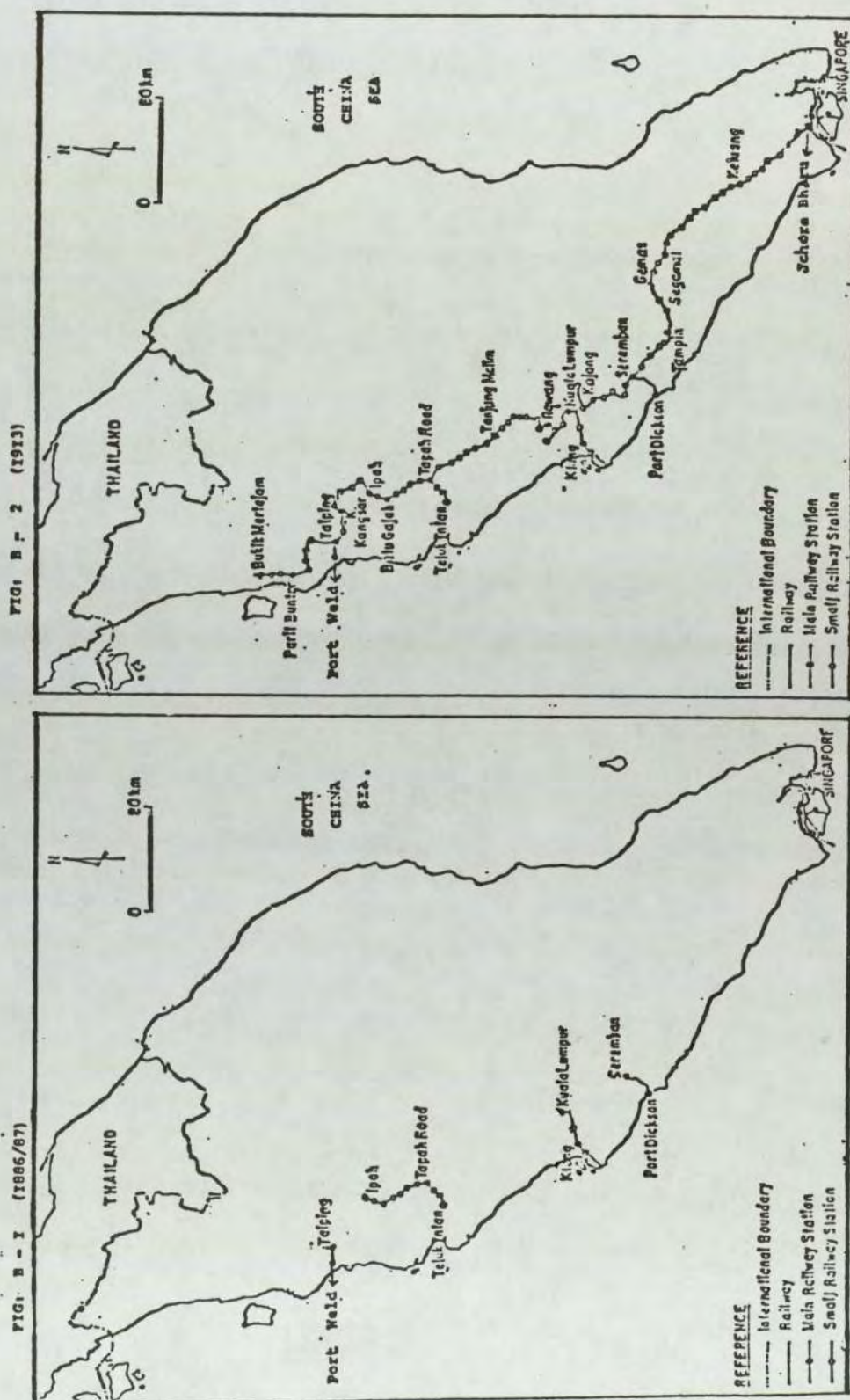
- International boundary .....
- By 1980 - - - -
- Built after 1980 ———

Major cities and locations marked include: Kangar, Alor Star, Kota Bharu, Pasir Puteh, Kuala Krai, Dabong, Gua Musang, Dungun, Chukai, Kuantan, Maran, Temerloh, Raub, Tg. Malim, Bidar, Ipoh, Kampar, Lumut, Telok Anson, Sabak Bernam, Kuala Lumpur, Klang, Seremban, Kuala Bahau, Pilah, Bt. Iban, Segamat, Melaka, Johor Bahru, Kota Tinggi, Kg. Sg. Rengit, and Singapore.

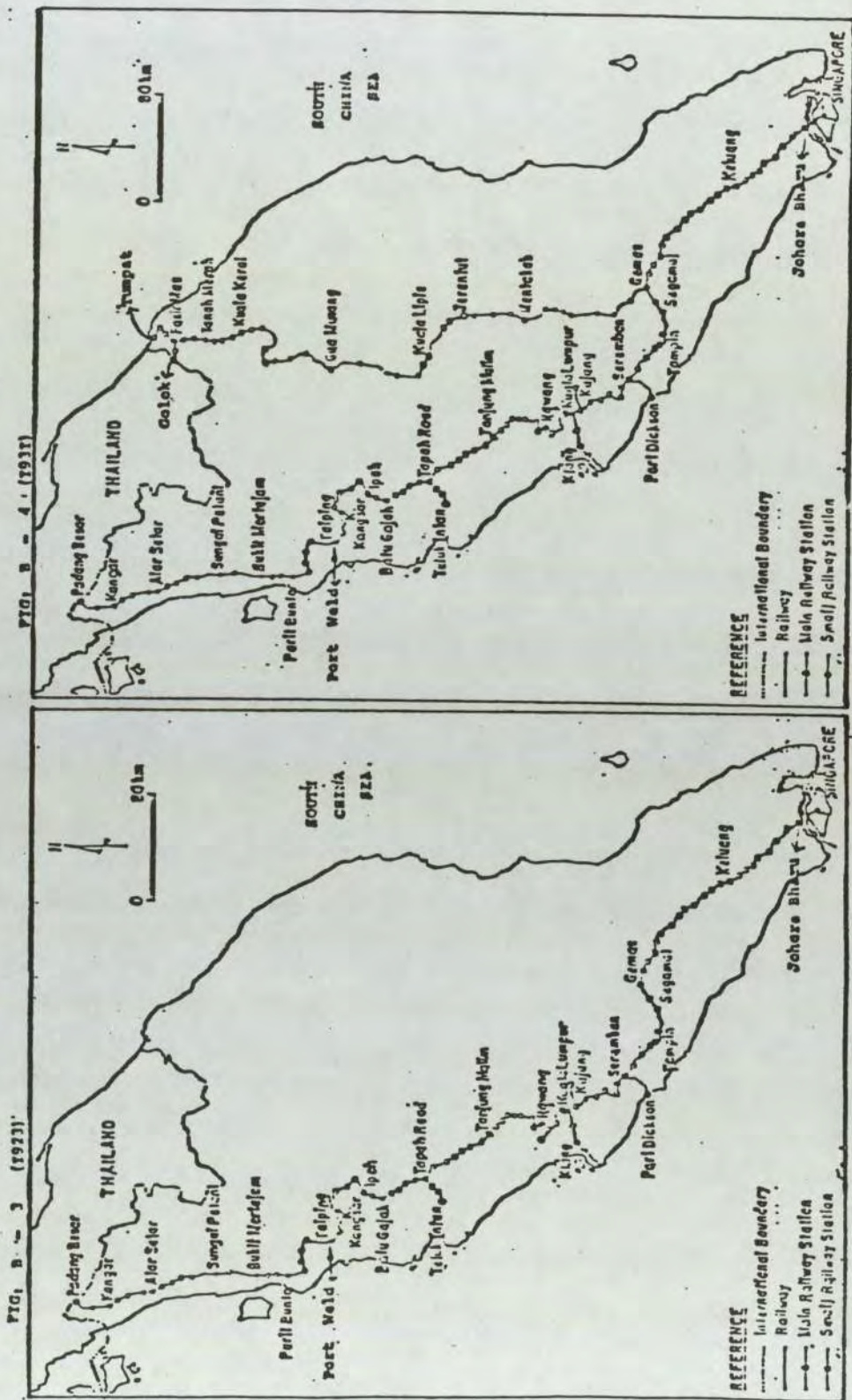
Geographical features include: THAILAND, SOUTH CHINA SEA, and the Isthmus of Kra.



# APPENDIX B MALAYAN RAILWAY NETWORK DEVELOPMENT 1886 TO 1931



## NETWORK DEVELOPMENT 1886 TO 1931





# **APPENDIX C** **PASSENGER AND FREIGHT TRAFFIC GROWTH**

**TABLE C-1**  
**MR PASSENGER TRAFFIC GROWTH 1981-1987**

| Year | Passenger-Journey |          | Passenger-Km |          | Passenger-Revenue |          |
|------|-------------------|----------|--------------|----------|-------------------|----------|
|      | '000              | Growth % | '000         | Growth % | '000              | Growth % |
| 1981 | 7,356             | -        | 1,640,111    | -        | 60,100            | -        |
| 1982 | 7,117             | -3.2     | 1,615,295    | -1.5     | 60,059            | -0.1     |
| 1983 | 6,641             | -6.7     | 1,498,725    | -7.2     | 56,300            | -6.3     |
| 1984 | 6,634             | -0.1     | 1,512,300    | +0.9     | 59,984            | +6.5     |
| 1985 | 6,356             | -4.2     | 1,408,752    | -6.8     | 63,617            | +6.1     |
| 1986 | 6,735             | +5.6     | 1,368,531    | -2.9     | 62,890            | -1.9     |

Source: Commercial Department, MR

**TABLE C-2**  
**MR FREIGHT TRAFFIC GROWTH 1981-1986**

| Year | Freight Traffic |          | Freight Revenue |          |
|------|-----------------|----------|-----------------|----------|
|      | tonne '000      | Growth % | tonne '000      | Growth % |
| 1981 | 3,374           | -        | 59,967          | -        |
| 1982 | 3,232           | -4.2     | 57,826          | -3.6     |
| 1983 | 3,187           | -1.4     | 59,229          | +2.4     |
| 1984 | 3,255           | +2.1     | 56,246          | -5.0     |
| 1985 | 2,929           | -10.0    | 50,048          | -11.0    |
| 1986 | 2,860           | -2.4     | 50,322          | +0.5     |

Source: Commercial Department, MR

**APPENDIX D-1**  
**INCOME AND EXPENDITURE ACCOUNTS (\$ MILLION)**  
**1982-1986**

|                                        | 1982      | 1983      | 1984      | 1985      | 1986      |
|----------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>INCOME</b>                          |           |           |           |           |           |
| Passengers                             | 60.059    | 56.300    | 59.984    | 63.617    | 62.890    |
| Parcels and mails                      | 6.336     | 7.935     | 7.941     | 7.660     | 7.012     |
| Goods                                  | 57.826    | 59.229    | 56.246    | 50.048    | 50.322    |
| Miscellaneous                          | 6.184     | 5.929     | 5.613     | 5.832     | 58.301*   |
| Collection & delivery                  | 1.545     | 1.390     | 1.116     | 0.689     | 0.737     |
| Rents                                  | 9.617     | 11.138    | 11.961    | 12.469    | 10.776    |
| Interest on investment                 | 0.615     | 0.787     | 1.365     | 2.417     | 4.962     |
|                                        | 142.182   | 142.708   | 144.226   | 142.732   | 195.000   |
| <b>EXPENDITURE</b>                     |           |           |           |           |           |
| Maintenance of way and works           | 28.324    | 33.208    | 35.128    | 39.040    | 34.373    |
| Maintenance of rolling stock           | 28.806    | 23.345    | 19.255    | 55.707    | 60.960    |
| Locomotives operations                 | 35.902    | 28.267    | 31.619    | -         | -         |
| Traffic operations                     | 41.647    | 41.495    | 43.325    | 41.644    | 41.329    |
| Administrative and general expenditure | 9.599     | 10.251    | 11.008    | 12.949    | 15.191    |
| Upkeep of rentable property            | 2.805     | 2.177     | 2.298     | -         | -         |
| Signalling and communication           | 4.356     | 4.749     | 4.688     | 5.599     | 6.629     |
| Miscellaneous                          | 0.009     | 0.037     | 0.023     | -         | 0.835     |
| Provision for depreciation             | 16.530    | 21.824    | 25.176    | 26.807    | 28.742    |
|                                        | 167.978   | 165.353   | 172.520   | 181.746   | 188.059   |
| Operating profit/(loss)                | (25.796)  | (22.645)  | (28.294)  | (39.014)  | 6.941     |
| Interest on loans                      | (14.182)  | (20.890)  | (31.021)  | (38.721)  | (39.363)  |
| Profit (loss) for the year             | (39.978)  | (43.535)  | (59.315)  | (77.735)  | (32.322)  |
| Prior year's adjustments               | 122.098   | 2.561     | (0.068)   | (0.109)   | 4.337     |
|                                        | 82.120    | (40.974)  | (59.383)  | (77.844)  | (27.985)  |
| Accumulated loss b/f                   | (225.365) | (143.245) | (184.219) | (243.602) | (321.446) |
| Accumulated loss c/f                   | (143.245) | (184.219) | (243.602) | (321.446) | (349.431) |

Source: Finance Department, MR

\* included M\$ 54.056 mil paid by Singapore Government for the compensation on the land (15.3396 hec.) belonging to MR in Singapore.



**APPENDIX D-2**  
**BALANCE SHEET (\$ MILLION)**  
**1982-1986**

|                                     | 1982      | 1983      | 1984      | 1985      | 1986      |
|-------------------------------------|-----------|-----------|-----------|-----------|-----------|
| <b>FIXED ASSETS</b>                 |           |           |           |           |           |
| Fixed assets in service             | 779.611   | 877.884   | 1000.073  | 1078.877  | 1197.045  |
| Accumulated depreciation            | 358.284   | 378.448   | 402.734   | 423.486   | 430.503   |
|                                     | 421.327   | 499.436   | 597.339   | 655.391   | 766.542   |
| <b>INVESTMENT</b>                   |           |           |           |           |           |
| Investment in equities              | 0.638     | 0.735     | 0.735     | 0.735     | 0.835     |
| Malayan Securities                  | 0.301     | 0.301     | 0.301     | 0.301     | 0.301     |
|                                     | 0.939     | 1.036     | 1.036     | 1.036     | 1.136     |
| <b>CURRENT ASSETS</b>               |           |           |           |           |           |
| Work-in progress                    | 96.244    | 167.080   | 180.422   | 130.912   | 61.030    |
| Inventories                         | 65.624    | 81.896    | 53.961    | 72.669    | 84.020    |
| Sundry debtors                      | 20.775    | 24.091    | 24.031    | 26.689    | 46.527    |
| Cash in hand and bank               | 23.544    | 38.118    | 51.328    | 45.040    | 44.805    |
|                                     | 206.187   | 311.185   | 309.724   | 275.310   | 236.382   |
| <b>LESS:</b>                        |           |           |           |           |           |
| <b>CURRENT LIABILITIES</b>          |           |           |           |           |           |
| Sundry creditors                    | 52.065    | 38.171    | 57.457    | 81.042    | 78.967    |
| Deposit                             | 25.714    | 14.819    | 14.971    | 11.373    | 10.506    |
|                                     | 77.779    | 52.990    | 72.428    | 92.415    | 89.473    |
|                                     | 550.674   | 758.667   | 835.671   | 839.322   | 914.588   |
| <b>FINANCED BY:</b>                 |           |           |           |           |           |
| <b>CAPITAL &amp; RESERVES</b>       |           |           |           |           |           |
| Federal Govt. equity                | 194.459   | 194.459   | 194.459   | 194.459   | 194.459   |
| General reserve                     | 81.531    | 81.531    | 81.531    | 81.531    | 81.531    |
| Fire insurance reserve              | 0.288     | 0.288     | 0.288     | 0.288     | 0.288     |
| Federal Govt. grant                 | -         | 21.993    | 42.095    | 50.864    | 76.833    |
|                                     | 276.278   | 298.271   | 318.373   | 327.142   | 353.11    |
| Accumulated profit/(loss)           | (143.245) | (184.219) | (243.602) | (321.446) | (349.431) |
|                                     | 133.033   | 114.052   | 74.771    | 5.696     | 3.680     |
| <b>LONG TERM LOANS</b>              |           |           |           |           |           |
| Federal Govt. loans                 | 367.840   | 515.818   | 633.857   | 707.065   | 846.573   |
| Economic Dev. Board                 |           |           |           |           |           |
| Singapore                           | 5.775     | 5.674     | 5.589     | 5.544     | 5.341     |
| World Bank                          | 32.670    | 31.146    | 29.678    | 28.071    | 26.594    |
| KFW Germany                         | 7.120     | 8.930     | 9.464     | 9.464     | -         |
| Overseas Econ. Coop. Fund, Japan    | 4.236     | 60.864    | 60.864    | 62.813    | -         |
| Sunkyoung Ltd., Korea               | -         | 2.203     | 1.468     | 0.689     | -         |
| International Bank of Japan         | -         | 19.980    | 19.980    | 19.980    | 19.980    |
| British Rail Engineering Limited UK | -         | -         | -         | -         | 12.420    |
|                                     | 417.641   | 644.615   | 760.900   | 833.626   | 910.908   |
|                                     | 550.674   | 758.667   | 835.671   | 839.322   | 914.588   |
|                                     |           |           |           |           |           |

Source: Finance Department, MR



**APPENDIX E**  
**QUESTIONNAIRE FOR SURVEY IN SEPTEMBER 1987**

*SECTION 1*

This section refers to the background information of the respondent. Answer the following questions by ticking (✓) the appropriate boxes, or specify wherever necessary.

1. The state where you are living now.

- |                                             |                                                  |
|---------------------------------------------|--------------------------------------------------|
| 1. <input type="checkbox"/> Johore          | 9. <input type="checkbox"/> Penang               |
| 2. <input type="checkbox"/> Kedah           | 10. <input type="checkbox"/> Sabah               |
| 3. <input type="checkbox"/> Kelantan        | 11. <input type="checkbox"/> Sarawak             |
| 4. <input type="checkbox"/> Melaka          | 12. <input type="checkbox"/> Selangor            |
| 5. <input type="checkbox"/> Negeri Sembilan | 13. <input type="checkbox"/> Singapore           |
| 6. <input type="checkbox"/> Pahang          | 14. <input type="checkbox"/> Trengganu           |
| 7. <input type="checkbox"/> Perak           | 15. <input type="checkbox"/> Wilayah Persekutuan |
| 8. <input type="checkbox"/> Perlis          |                                                  |

2. The states where your parents are staying now.

- |                                             |                                                  |
|---------------------------------------------|--------------------------------------------------|
| 1. <input type="checkbox"/> Johore          | 9. <input type="checkbox"/> Penang               |
| 2. <input type="checkbox"/> Kedah           | 10. <input type="checkbox"/> Sabah               |
| 3. <input type="checkbox"/> Kelantan        | 11. <input type="checkbox"/> Sarawak             |
| 4. <input type="checkbox"/> Melaka          | 12. <input type="checkbox"/> Selangor            |
| 5. <input type="checkbox"/> Negeri Sembilan | 13. <input type="checkbox"/> Singapore           |
| 6. <input type="checkbox"/> Pahang          | 14. <input type="checkbox"/> Trengganu           |
| 7. <input type="checkbox"/> Perak           | 15. <input type="checkbox"/> Wilayah Persekutuan |
| 8. <input type="checkbox"/> Perlis          |                                                  |

3. Your age (year) ..... years old

4. Sex

- |                                  |                                    |
|----------------------------------|------------------------------------|
| 1. <input type="checkbox"/> Male | 2. <input type="checkbox"/> Female |
|----------------------------------|------------------------------------|

5. Marital Status

- |                                     |                                      |
|-------------------------------------|--------------------------------------|
| 1. <input type="checkbox"/> Single  | 3. <input type="checkbox"/> Divorced |
| 2. <input type="checkbox"/> Married | 4. <input type="checkbox"/> Widowed  |



6. Ethnic

- |                                     |                                               |
|-------------------------------------|-----------------------------------------------|
| 1. <input type="checkbox"/> Malay   | 4. <input type="checkbox"/> Others (Malysian) |
| 2. <input type="checkbox"/> Chinese | 5. <input type="checkbox"/> Foreigner         |
| 3. <input type="checkbox"/> India   |                                               |

7. Occupation

- |                                      |                                                    |
|--------------------------------------|----------------------------------------------------|
| 1. <input type="checkbox"/> Studying | 3. <input type="checkbox"/> Not in paid employment |
| 2. <input type="checkbox"/> Working  | 4. <input type="checkbox"/> Retired                |

If you are a student, go to question 10.

8. If you are employed, type of employment

- |                                                   |                                                     |
|---------------------------------------------------|-----------------------------------------------------|
| 1. <input type="checkbox"/> Labour/government     | 5. <input type="checkbox"/> Officer/government      |
| 2. <input type="checkbox"/> Labour/private sector | 6. <input type="checkbox"/> Officer/private sector  |
| 3. <input type="checkbox"/> Clerk/government      | 7. <input type="checkbox"/> Salesman/private sector |
| 4. <input type="checkbox"/> Clerk/private sector  | 8. <input type="checkbox"/> Self-employed           |

9. Monthly income

- |                                             |                                              |
|---------------------------------------------|----------------------------------------------|
| 1. <input type="checkbox"/> Less than \$200 | 4. <input type="checkbox"/> \$751-\$1000     |
| 2. <input type="checkbox"/> \$201-\$500     | 5. <input type="checkbox"/> More than \$1000 |
| 3. <input type="checkbox"/> \$501-\$750     |                                              |

10. Type of transport owned

- |                                          |                                                          |
|------------------------------------------|----------------------------------------------------------|
| 1. <input type="checkbox"/> No Transport | 4. <input type="checkbox"/> Motorcycle                   |
| 2. <input type="checkbox"/> Car          | 5. <input type="checkbox"/> Other, specify (eg. Bicycle) |
| 3. <input type="checkbox"/> Van          | .....                                                    |

11. Working or studying hours

- |                                                |                                               |
|------------------------------------------------|-----------------------------------------------|
| 1. <input type="checkbox"/> 7.30 am - 12.30 pm | 4. <input type="checkbox"/> 9.00 am - 5.00 pm |
| 2. <input type="checkbox"/> 1.00 pm - 6.00 pm  | 5. <input type="checkbox"/> Others, specify   |
| 3. <input type="checkbox"/> 8.00 am - 4.00 pm  | .....                                         |

## SECTION 2

This section requires information on travelling by train. Answer the following questions by ticking (✓) the appropriate boxes, or specify wherever necessary.

12. The purpose of journey (can answer more than one).

- |                                                   |                                                             |
|---------------------------------------------------|-------------------------------------------------------------|
| 1. <input type="checkbox"/> To work               | 6. <input type="checkbox"/> to home town                    |
| 2. <input type="checkbox"/> To college or school  | 7. <input type="checkbox"/> to special occasion or festival |
| 3. <input type="checkbox"/> important business    | 8. <input type="checkbox"/> leisure/holiday                 |
| 4. <input type="checkbox"/> shopping              | 9. <input type="checkbox"/> Others, specify                 |
| 5. <input type="checkbox"/> visit friend/relative |                                                             |

.....

13. Journey frequency

- |                                               |                                           |
|-----------------------------------------------|-------------------------------------------|
| 1. <input type="checkbox"/> every working day | 4. <input type="checkbox"/> every weekend |
| 2. <input type="checkbox"/> every week        | 5. <input type="checkbox"/> occasionally  |
| 3. <input type="checkbox"/> every month       |                                           |

14. If you travel occasionally, how many times in a year? ..... times a year

15. Type of transport you used most (only one or two answers)

- |                                        |                                             |
|----------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> Trishaw    | 6. <input type="checkbox"/> Train           |
| 2. <input type="checkbox"/> Motorcycle | 7. <input type="checkbox"/> Aeroplane       |
| 3. <input type="checkbox"/> Car        | 8. <input type="checkbox"/> Boat/ferry      |
| 4. <input type="checkbox"/> Taxi       | 9. <input type="checkbox"/> Others, specify |
| 5. <input type="checkbox"/> Bus        |                                             |

.....

16. Type of transport available in your area (can answer more than one)

- |                                        |                                             |
|----------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> Trishaw    | 6. <input type="checkbox"/> Train           |
| 2. <input type="checkbox"/> Motorcycle | 7. <input type="checkbox"/> Aeroplane       |
| 3. <input type="checkbox"/> Car        | 8. <input type="checkbox"/> Boat/ferry      |
| 4. <input type="checkbox"/> Taxi       | 9. <input type="checkbox"/> Others, specify |
| 5. <input type="checkbox"/> Bus        |                                             |

.....



17. Type of transport you have to take before the train (can answer more than one)

- |                                        |                                             |
|----------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> Trishaw    | 6. <input type="checkbox"/> Train           |
| 2. <input type="checkbox"/> Motorcycle | 7. <input type="checkbox"/> Aeroplane       |
| 3. <input type="checkbox"/> Car        | 8. <input type="checkbox"/> Boat/ferry      |
| 4. <input type="checkbox"/> Taxi       | 9. <input type="checkbox"/> Others, specify |
| 5. <input type="checkbox"/> Bus        | .....                                       |

18. Type of transport you have to take after the train (can answer more than one)

- |                                        |                                             |
|----------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> Trishaw    | 6. <input type="checkbox"/> Train           |
| 2. <input type="checkbox"/> Motorcycle | 7. <input type="checkbox"/> Aeroplane       |
| 3. <input type="checkbox"/> Car        | 8. <input type="checkbox"/> Boat/ferry      |
| 4. <input type="checkbox"/> Taxi       | 9. <input type="checkbox"/> Others, specify |
| 5. <input type="checkbox"/> Bus        | .....                                       |

19. Type of ticket used

- |                                                     |                                             |
|-----------------------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> Ordinary fare (one way) | 5. <input type="checkbox"/> Monthly pass    |
| 2. <input type="checkbox"/> Ordinary fare (return)  | 6. <input type="checkbox"/> Yearly pass     |
| 3. <input type="checkbox"/> Concessionary ticket    | 7. <input type="checkbox"/> Others, specify |
| 4. <input type="checkbox"/> Weekly pass             | .....                                       |

20. Type of service for this journey

- |                                                          |                                                              |
|----------------------------------------------------------|--------------------------------------------------------------|
| 1. <input type="checkbox"/> Ordinary train (local train) | 5. <input type="checkbox"/> Sinaran Pagi (am) Express        |
| 2. <input type="checkbox"/> Day Mail                     | 6. <input type="checkbox"/> Sinran Petang (pm) Express       |
| 3. <input type="checkbox"/> Night Mail                   | 7. <input type="checkbox"/> Senandung Malam (night sleepers) |
| 4. <input type="checkbox"/> Rakyat Express               |                                                              |

21. Service class of the ticket purchased.

- |                                                               |                                                                      |
|---------------------------------------------------------------|----------------------------------------------------------------------|
| 1. <input type="checkbox"/> 3rd class                         | 5. <input type="checkbox"/> 2nd class (with berth - lowerbed)        |
| 2. <input type="checkbox"/> 2nd class (ordinary)              | 6. <input type="checkbox"/> 1st class ordinary                       |
| 3. <input type="checkbox"/> 2nd class (airconditioned)        | 7. <input type="checkbox"/> 1st class airconditioned (not exclusive) |
| 4. <input type="checkbox"/> 2nd class (with berth - upperbed) | 8. <input type="checkbox"/> 1st class airconditioned (exclusive)     |

22. The fare you paid for this journey \$ .....

23. Total travelling expenses in a year (fare/petrol) for all types of transportation.

\$ .....

24. Total travelling expenses in a year by train only \$ .....

25. For this question please tick (✓) two appropriate boxes, ie. the station you depart from and the station of your destination.

1. ☐ Alor Setar
2. ☐ Sungai Petani
3. ☐ Bukit Mertajam
4. ☐ Pinang Tunggal
5. ☐ Butterworth
6. ☐ Taiping
7. ☐ Kuala Kangsar
8. ☐ Ipoh
9. ☐ Tapah Road
10. ☐ Teluk Intan
11. ☐ Rawang
12. ☐ Batu Caves
13. ☐ Kuala Lumpur

14. ☐ Pelabuhan Klang
15. ☐ Ampang
16. ☐ Petaling
17. ☐ Kajang
18. ☐ Seremban
19. ☐ Port Dickson
20. ☐ Tampin
21. ☐ Bahau
22. ☐ Gemas
23. ☐ Segamat
24. ☐ Kluang
25. ☐ Johore Bharu
26. ☐ Singapore
27. ☐ Others, specify .....

26. Number of times you travel to the destination in question (25) above in a year (including by other types of transporation)

..... times a year

27. How many times do you travel by train this year including this journey?

..... times

Notes: Questions (28) to (31) below are for those who commute everyday by train from home to his/her working/studying place.

28. The time you depart from the station where you start your journey.

1. ☐ 5.00-5.30 am
2. ☐ 5.30-6.00 am
3. ☐ 6.00-6.30 am
4. ☐ 6.30-7.00 am

5. ☐ 7.00-7.30 am
6. ☐ 7.30-8.00 am
7. ☐ 8.30-9.00 am
8. ☐ Others, specify

.....

29. Arrival time at the destination (railway station)

1. ☐ 6.00-6.30 am
2. ☐ 6.30-7.00 am
3. ☐ 7.00-7.30 am
4. ☐ 7.30-8.00 am

5. ☐ 8.00-8.30 am
6. ☐ 8.30-9.00 am
7. ☐ 9.00-9.30 am
8. ☐ Others, specify

.....



30. The time you depart from the station at your working/studying place to return home.

- |                                          |                                             |
|------------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> 4.00-4.30 pm | 5. <input type="checkbox"/> 6.00-6.30 pm    |
| 2. <input type="checkbox"/> 4.30-5.00 pm | 6. <input type="checkbox"/> 6.30-7.00 pm    |
| 3. <input type="checkbox"/> 5.00-5.30 pm | 7. <input type="checkbox"/> Others, specify |
| 4. <input type="checkbox"/> 5.30-6.00 pm | .....                                       |

31. Arrival time at your home station (railway station).

- |                                          |                                             |
|------------------------------------------|---------------------------------------------|
| 1. <input type="checkbox"/> 4.00-5.00 pm | 5. <input type="checkbox"/> 6.30-7.00 pm    |
| 2. <input type="checkbox"/> 5.00-5.30 pm | 6. <input type="checkbox"/> 7.00-7.30 pm    |
| 3. <input type="checkbox"/> 5.30-6.00 pm | 7. <input type="checkbox"/> 7.30-8.00 pm    |
| 4. <input type="checkbox"/> 6.00-6.30 pm | 8. <input type="checkbox"/> Others, specify |
|                                          | .....                                       |

32. Reason(s) why you choose to travel by train for this journey (can answer more than one).

- |                                                                                  |                                                                      |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------|
| 1. <input type="checkbox"/> a walking distance from my house                     | 8. <input type="checkbox"/> meet new people                          |
| 2. <input type="checkbox"/> railway station easily accessible by other transport | 9. <input type="checkbox"/> able to do some work on the journey      |
| 3. <input type="checkbox"/> reasonable fare                                      | 10. <input type="checkbox"/> staff courtesy                          |
| 4. <input type="checkbox"/> train is safer                                       | 11. <input type="checkbox"/> spacious, easy movement for my children |
| 5. <input type="checkbox"/> enjoying the scenery                                 | 12. <input type="checkbox"/> no other choice                         |
| 6. <input type="checkbox"/> comfortable on the train                             | 13. <input type="checkbox"/> Other, specify                          |
| 7. <input type="checkbox"/> good facilities on the train                         | .....                                                                |

33. How important is the travelling for you.

- |                                                             |                                            |
|-------------------------------------------------------------|--------------------------------------------|
| 1. <input type="checkbox"/> not necessary, but still travel | 3. <input type="checkbox"/> important      |
| 2. <input type="checkbox"/> necessary, but occasionally     | 4. <input type="checkbox"/> very important |

### SECTION 3

This section required the respondents' opinion on fares and quality of service of MR. Please answer the following by ticking (✓) the appropriate boxes or explain where necessary.

34. Peak hour for MR service are as follows:

Kuala Lumpur, Butterworth and Singapore/Johore Bharu are: 6.00 am-8.30 am, 12.30 pm - 3.00 pm and 5.00 pm - 10.00 pm.

Ipoh and Gemas are: 9.30 am - 11.00 am and 11.00 pm - 2.00 pm.

If MR offers a discount during off-peak hours how much discount are you willing to accept?

- |                                                         |                                                |
|---------------------------------------------------------|------------------------------------------------|
| 1. <input type="checkbox"/> 10% (every \$10 deduct \$1) | 4. <input type="checkbox"/> 25%                |
| 2. <input type="checkbox"/> 15%                         | 5. <input type="checkbox"/> No discount needed |
| 3. <input type="checkbox"/> 20%                         |                                                |

35. If MR offers a discount with the condition that the passengers have to travel by train more than 10 times in 12 months within 100Km distance, how much discount are you willing to accept?

- |                                 |                                                |
|---------------------------------|------------------------------------------------|
| 1. <input type="checkbox"/> 10% | 4. <input type="checkbox"/> 25%                |
| 2. <input type="checkbox"/> 15% | 5. <input type="checkbox"/> No discount needed |
| 3. <input type="checkbox"/> 20% |                                                |

36. If MR offers a discount with the condition that the passengers have to travel by train more than five times in 12 months for more than 100Km in distance how much discount are you willing to accept?

- |                                 |                                                |
|---------------------------------|------------------------------------------------|
| 1. <input type="checkbox"/> 10% | 4. <input type="checkbox"/> 25%                |
| 2. <input type="checkbox"/> 15% | 5. <input type="checkbox"/> No discount needed |
| 3. <input type="checkbox"/> 20% |                                                |

37. Do you think the price you pay for this journey is reasonable compared to the fares of other modes of transport.

- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. <input type="checkbox"/> Yes | 2. <input type="checkbox"/> No |
|---------------------------------|--------------------------------|

38. If MR increases the fare by between \$1to \$3 (depending on the distance) and at the same time provides facilities such as daily newspapers, refreshments and guaranteed seat (numbered) would you support it?

- |                                 |                                |
|---------------------------------|--------------------------------|
| 1. <input type="checkbox"/> Yes | 2. <input type="checkbox"/> No |
|---------------------------------|--------------------------------|



39. MR plans to launch the railbus service in March 1988. Its fares will be the same as the bus fares and it will run faster than an ordinary train. Would you be willing to travel by the railbus?

1. ☐ Yes

2. ☐ No

40. In your opinion how much is the reasonable fare (one way) for the journey you make with the present quality of service.

\$ .....

Question (41) to (49) require the respondents' opinion on whether the present facilities are satisfactory or not.

41. Ticketing system

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

42. Waiting area at the station.

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

43. Cleanliness on the train.

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

44. Seats on the train

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

45. Toilets on the train

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

46. Staff at the station.

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

47. Staff on the train

1. ☐ Very bad

2. ☐ Bad

3. ☐ Fairly good but should improve

4. ☐ Excellent

48. Quality of food in the canteen on the train.

1. ☐ Very bad
2. ☐ Bad
3. ☐ Fairly good but should improve
4. ☐ Excellent

49. The price of the food in the canteen on the train.

1. ☐ Expensive                      3. ☐ Cheap  
2. ☐ Reasonable

50. When was the last time you say MR's advertisements on its service and offers to the passenger.

1. ☐ Last week
2. ☐ Few months ago
3. ☐ Last month
4. ☐ Last year

51. Where was the last time you saw MR's advertisement.

1. ☐ Radio and TV
2. ☐ Newspaper/Magazine
3. ☐ Poster at the railway
4. ☐ Poster at other places
5. ☐ Hoarding
6. ☐ At certain exhibitions
7. ☐ Leaflet/booklet
8. ☐ Others, specify \_\_\_\_\_

.....

## SECTION 4

This section requires the respondent to rank the answer from numbers 1 to 5.

52. Fare/Cost

|                                                                    |           |   |   |   |          |
|--------------------------------------------------------------------|-----------|---|---|---|----------|
|                                                                    | Expensive |   |   |   | Cheapest |
| Transport                                                          | 1         | 2 | 3 | 4 | 5        |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |           |   |   |   |          |



53. Speed

|                                                                    | Slowest |   |   |   | Fastest |
|--------------------------------------------------------------------|---------|---|---|---|---------|
| Transport                                                          | 1       | 2 | 3 | 4 | 5       |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |         |   |   |   |         |

54. Average waiting time

|                                                                    | Longest |   |   |   | Shortest |
|--------------------------------------------------------------------|---------|---|---|---|----------|
| Transport                                                          | 1       | 2 | 3 | 4 | 5        |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |         |   |   |   |          |

55. Frequency of service

|                                                                    | Lowest |   |   |   | Highest |
|--------------------------------------------------------------------|--------|---|---|---|---------|
| Transport                                                          | 1      | 2 | 3 | 4 | 5       |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |        |   |   |   |         |

56. Comfort during journey

|                                                                    | Worst |   |   |   | Best |
|--------------------------------------------------------------------|-------|---|---|---|------|
| Transport                                                          | 1     | 2 | 3 | 4 | 5    |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |       |   |   |   |      |

57. Ticketing system

|                                                                    | Complicated |   |   |   | Easiest |
|--------------------------------------------------------------------|-------------|---|---|---|---------|
| Transport                                                          | 1           | 2 | 3 | 4 | 5       |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |             |   |   |   |         |

58. Opportunity to work during the journey (including reading and discussion).

|                                                 | Worst |   |   |   | Best |
|-------------------------------------------------|-------|---|---|---|------|
| Transport                                       | 1     | 2 | 3 | 4 | 5    |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Aeroplane |       |   |   |   |      |



59. Staff courtesy

|                                   | Worst |   |   |   | Best |
|-----------------------------------|-------|---|---|---|------|
| Transport                         | 1     | 2 | 3 | 4 | 5    |
| Bus<br>Train<br>Taxi<br>Aeroplane |       |   |   |   |      |

60. Enjoyment of the scenery throughout the journey

|                                                                    | Boring |   |   |   | Enjoyable |
|--------------------------------------------------------------------|--------|---|---|---|-----------|
| Transport                                                          | 1      | 2 | 3 | 4 | 5         |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |        |   |   |   |           |

61. Safety

|                                                                    | Least safe |   |   |   | Safest |
|--------------------------------------------------------------------|------------|---|---|---|--------|
| Transport                                                          | 1          | 2 | 3 | 4 | 5      |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |            |   |   |   |        |

62. Overall conclusion. Rank your answer according to the mode which you most like to travel with.

|                                                                    | Worst |   |   |   | Best |
|--------------------------------------------------------------------|-------|---|---|---|------|
| Transport                                                          | 1     | 2 | 3 | 4 | 5    |
| Bus<br>Train<br>Taxi<br>Shared Car<br>Own car (alone)<br>Aeroplane |       |   |   |   |      |

THANK YOU FOR COMPLETING THE QUESTIONNAIRE



APPENDIX E-1  
SOALSELIDIK BAGI SURVEY SEPTEMBER 1987

BAHAGIAN 1

Bahagian ini merujuk kepada maklumat latar responden. Jawabkan soalan-soalan di bawah dengan membuat tanda (/) di dalam kotak yang berkenaan, atau terangkan di mana perlu.

1. Negeri tempat tinggal anda sekarang

- |   |                          |                 |    |                          |                     |
|---|--------------------------|-----------------|----|--------------------------|---------------------|
| 1 | <input type="checkbox"/> | Johor           | 9  | <input type="checkbox"/> | Pulau Pinang        |
| 2 | <input type="checkbox"/> | Kedah           | 10 | <input type="checkbox"/> | Sabah               |
| 3 | <input type="checkbox"/> | Kelantan        | 11 | <input type="checkbox"/> | Sarawak             |
| 4 | <input type="checkbox"/> | Melaka          | 12 | <input type="checkbox"/> | Selangor            |
| 5 | <input type="checkbox"/> | Negeri Sembilan | 13 | <input type="checkbox"/> | Singapura           |
| 6 | <input type="checkbox"/> | Pahang          | 14 | <input type="checkbox"/> | Terengganu          |
| 7 | <input type="checkbox"/> | Perak           | 15 | <input type="checkbox"/> | Wilayah Persekutuan |
| 8 | <input type="checkbox"/> | Perlis          |    |                          |                     |

2. Negeri tempat tinggal ibubapa

- |   |                          |                 |    |                          |                     |
|---|--------------------------|-----------------|----|--------------------------|---------------------|
| 1 | <input type="checkbox"/> | Johor           | 9  | <input type="checkbox"/> | Pulau Pinang        |
| 2 | <input type="checkbox"/> | Kedah           | 10 | <input type="checkbox"/> | Sabah               |
| 3 | <input type="checkbox"/> | Kelantan        | 11 | <input type="checkbox"/> | Sarawak             |
| 4 | <input type="checkbox"/> | Melaka          | 12 | <input type="checkbox"/> | Selangor            |
| 5 | <input type="checkbox"/> | Negeri Sembilan | 13 | <input type="checkbox"/> | Singapura           |
| 6 | <input type="checkbox"/> | Pahang          | 14 | <input type="checkbox"/> | Terengganu          |
| 7 | <input type="checkbox"/> | Perak           | 15 | <input type="checkbox"/> | Wilayah Persekutuan |
| 8 | <input type="checkbox"/> | Perlis          |    |                          |                     |

3. Umur anda (tahun)

\_\_\_\_\_ tahun

4. Jantina

1 ☐ Lelaki

2 ☐ Perempuan

5. Taraf perkahwinan

1 ☐ Bujang

3 ☐ Bercerai

2 ☐ Berkahwin

4 ☐ Balu

6. Keturunan

1 ☐ Melayu

4 ☐ Lain-lain  
(Malaysia)

2 ☐ China

5 ☐ Warganegara  
Asing

3 ☐ India

7. Pekerjaan

1 ☐ Belajar

3 ☐ Menganggur

2 ☐ Bekerja

4 ☐ Bersara

Jika pelajar, teruskan ke soalan (10).

8. Jika anda bekerja jenis pekerjaan yang anda terlibat

1 ☐ Buruh/Kerajaan

5 ☐ Pegawai/Kerajaan

2 ☐ Buruh/Swasta

6 ☐ Pegawai/Swasta

3 ☐ Kerani/Kerajaan

7 ☐ Jurujual/Swasta

4 ☐ Kerani/Swasta

8 ☐ Berniaga sendiri



9. Pendapatan bulanan

- |   |                      |                   |   |                      |                  |
|---|----------------------|-------------------|---|----------------------|------------------|
| 1 | <input type="text"/> | Kurang dari \$200 | 4 | <input type="text"/> | \$751 - \$1000   |
| 2 | <input type="text"/> | \$201 - \$500     | 5 | <input type="text"/> | Lebih dari \$100 |
| 3 | <input type="text"/> | \$501 - \$750     |   |                      |                  |

10. Jenis kenderaan yang anda miliki

- |   |                      |                 |   |                      |                     |
|---|----------------------|-----------------|---|----------------------|---------------------|
| 1 | <input type="text"/> | Tiada kenderaan | 4 | <input type="text"/> | Motosikal           |
| 2 | <input type="text"/> | Motokar         | 5 | <input type="text"/> | Lain-lain, nyatakan |
| 3 | <input type="text"/> | Van             |   |                      | .....               |

11. Masa bekerja/belajar anda

- |   |                      |                              |
|---|----------------------|------------------------------|
| 1 | <input type="text"/> | 7.30 pagi - 12.30 tengahari  |
| 2 | <input type="text"/> | 1.00 tengahari - 6.00 petang |
| 3 | <input type="text"/> | 8.00 pagi - 4.00 petang      |
| 4 | <input type="text"/> | 9.00 pagi - 5.00 petang      |
| 5 | <input type="text"/> | Lain-lain, nyatakan .....    |

## BAHAGIAN II

Bahagian ini memerlukan maklumat mengenai perjalanan anda dengan keretapi. Jawab soalan-soalan di bawah dengan membuat tanda (/) di dalam kotak-kotak yang berkenaan atau terangkan di mana perlu.

12. Tujuan perjalanan ini (boleh dijawab lebih dari 1)

- |   |                          |                                 |
|---|--------------------------|---------------------------------|
| 1 | <input type="checkbox"/> | Ke tempat kerja                 |
| 2 | <input type="checkbox"/> | Ke tempat belajar               |
| 3 | <input type="checkbox"/> | Urusan penting                  |
| 4 | <input type="checkbox"/> | Membeli-belah                   |
| 5 | <input type="checkbox"/> | Melawat saudara/kawan           |
| 6 | <input type="checkbox"/> | Balik kampung                   |
| 7 | <input type="checkbox"/> | Melihat perayaan/pesta tertentu |
| 8 | <input type="checkbox"/> | Bersuka-suka/makan angin        |
| 9 | <input type="checkbox"/> | Lain-lain, nyatakan .....       |

13. Kekerapan perjalanan anda

- |   |                          |                      |   |                          |                       |
|---|--------------------------|----------------------|---|--------------------------|-----------------------|
| 1 | <input type="checkbox"/> | Tiap-tiap hari kerja | 4 | <input type="checkbox"/> | Tiap-tiap hari minggu |
| 2 | <input type="checkbox"/> | Tiap-tiap minggu     | 5 | <input type="checkbox"/> | Sekali-sekala         |
| 3 | <input type="checkbox"/> | Tiap-tiap bulan      |   |                          |                       |

14. Jika anda membuat perjalanan sekali-sekala sahaja, berapa kalikah anda lakukan dalam setahun?

\_\_\_\_\_ kali setahun.



15. Jenis kenderaan yang paling kerap anda gunakan (1 atau 2 jawapan sahaja).

1 | ☐ | Beca

5 | ☐ | Bas

2 | ☐ | Motosikal

6 | ☐ | Keretapi

3 | ☐ | Motokar

7 | ☐ | Kapal terbang

4 | ☐ | Teksi

8 | ☐ | Perahu/botferi

9 | ☐ | Lain-lain,  
nyatakan  
.....

16. Jenis kenderaan yang terdapat di tempat tinggal anda (boleh dijawab lebih dari 1)

1 | ☐ | Beca

6 | ☐ | Kapal terbang

2 | ☐ | Motosikal

7 | ☐ | Perahu/bot/feri

3 | ☐ | Motokar

8 | ☐ | Basikal

4 | ☐ | Teksi

9 | ☐ | Lain-lain,  
nyatakan  
.....

5 | ☐ | Bas

17. Jenis kenderaan yang mesti anda gunakan sebelum anda menaiki keretapi. (Boleh dijawab lebih dari satu)

1 | ☐ | Beca

6 | ☐ | Kapal terbang

2 | ☐ | Motosikal

7 | ☐ | Perahu/bot/feri

3 | ☐ | Motokar

8 | ☐ | Basikal

4 | ☐ | Teksi

9 | ☐ | Lain-lain,  
nyatakan  
.....

5 | ☐ | Bas

18. Jenis kenderaan yang mesti anda gunakan selepas turun dari keretapi. (Boleh dijawab lebih dari satu)

- |   |                          |           |   |                          |                                 |
|---|--------------------------|-----------|---|--------------------------|---------------------------------|
| 1 | <input type="checkbox"/> | Beca      | 6 | <input type="checkbox"/> | Kapal terbang                   |
| 2 | <input type="checkbox"/> | Motosikal | 7 | <input type="checkbox"/> | Perahu/bot/feri                 |
| 3 | <input type="checkbox"/> | Motokar   | 8 | <input type="checkbox"/> | Basikal                         |
| 4 | <input type="checkbox"/> | Teksi     | 9 | <input type="checkbox"/> | Lain-lain,<br>nyatakan<br>..... |
| 5 | <input type="checkbox"/> | Bas       |   |                          |                                 |

19. Jenis tiket yang digunakan

- |   |                          |                             |
|---|--------------------------|-----------------------------|
| 1 | <input type="checkbox"/> | Tambang biasa (satu arah)   |
| 2 | <input type="checkbox"/> | Tambang biasa (pergi balik) |
| 3 | <input type="checkbox"/> | Konsesi                     |
| 4 | <input type="checkbox"/> | Pas mingguan                |
| 5 | <input type="checkbox"/> | Pas bulanan                 |
| 6 | <input type="checkbox"/> | Pas tahunan                 |
| 7 | <input type="checkbox"/> | Lain-lain, nyatakan .....   |

20. Jenis perkhidmatan keretapi untuk perjalanan ini.

- |   |                          |                              |
|---|--------------------------|------------------------------|
| 1 | <input type="checkbox"/> | Keretapi biasa (local train) |
| 2 | <input type="checkbox"/> | Mel siang                    |
| 3 | <input type="checkbox"/> | Mel malam                    |
| 4 | <input type="checkbox"/> | Ekspres rakyat               |
| 5 | <input type="checkbox"/> | Ekspres sinaran pagi         |
| 6 | <input type="checkbox"/> | Ekspres sinaran petang       |
| 7 | <input type="checkbox"/> | Lain-lain, nyatakan .....    |



21. Kelas perkhidmatan yang anda tumpangi

- 1    |  |    Kelas 3
- 2    |  |    Kelas 2 biasa
- 3    |  |    Kelas 2 berhawa dingin/tanpa tempat tidur
- 4    |  |    Kelas 2 berhawa dingin dan ada tempat tidur
- 5    |  |    Kelas 1 biasa
- 6    |  |    Kelas 1 berhawa dingin/bukan eksklusif
- 7    |  |    Kelas 1 berhawa dingin (eksklusif)

22. Tambang yang anda bayar bagi tujuan perjalanan ini.

\$ \_\_\_\_\_

23. Jumlah yang anda belanjakan untuk perjalanan (tambang/minyak kereta) dalam setahun (termasuk perjalanan dengan lain-lain jenis kenderaan).

\$ \_\_\_\_\_

24. Jumlah yang anda belanjakan untuk perjalanan (tambang) dalam setahun dengan keretapi sahaja.

\$ \_\_\_\_\_

25. Tandakan (/) pada stesyen-stesyen di mana anda memulakan perjalanan dan stesyen destinasi anda.

|    |                          |                |    |                          |                                 |
|----|--------------------------|----------------|----|--------------------------|---------------------------------|
| 1  | <input type="checkbox"/> | Alor Setar     | 14 | <input type="checkbox"/> | Pelabuhan Klang                 |
| 2  | <input type="checkbox"/> | Sungai Petani  | 15 | <input type="checkbox"/> | Ampang                          |
| 3  | <input type="checkbox"/> | Bukit Mertajam | 16 | <input type="checkbox"/> | Petaling                        |
| 4  | <input type="checkbox"/> | Pinang Tunggal | 17 | <input type="checkbox"/> | Kajang                          |
| 5  | <input type="checkbox"/> | Butterworth    | 18 | <input type="checkbox"/> | Seremban                        |
| 6  | <input type="checkbox"/> | Taiping        | 19 | <input type="checkbox"/> | Port Dickson                    |
| 7  | <input type="checkbox"/> | Kuala Kangsar  | 20 | <input type="checkbox"/> | Tampin                          |
| 8  | <input type="checkbox"/> | Ipoh           | 21 | <input type="checkbox"/> | Bahau                           |
| 9  | <input type="checkbox"/> | Tapah Road     | 22 | <input type="checkbox"/> | Gemas                           |
| 10 | <input type="checkbox"/> | Teluk Intan    | 23 | <input type="checkbox"/> | Segamat                         |
| 11 | <input type="checkbox"/> | Rawang         | 24 | <input type="checkbox"/> | Kluang                          |
| 12 | <input type="checkbox"/> | Batu caves     | 25 | <input type="checkbox"/> | Johor Bharu                     |
| 13 | <input type="checkbox"/> | Kuala Lumpur   | 26 | <input type="checkbox"/> | Singapura                       |
|    |                          |                | 27 | <input type="checkbox"/> | Lain-lain,<br>nyatakan<br>..... |

26. Purata kekerapan perjalanan anda ke destinasi (stesyen terakhir anda dalam soalan 25) dalam setahun (Termasuk perjalanan dengan lain-lain kenderaan)

\_\_\_\_\_ kali setahun

27. Berapa kalikah anda telah menggunakan keretapi dalam tahun ini, termasuk perjalanan ini.

\_\_\_\_\_ kali setahun



Nota:

----

Soalan (28) - (31) di bawah ditunjukkan kepada responden-responden yang berulang-alik setiap hari dari rumah ke tempat kerja/sekolah.

28. Masa anda memulakan perjalanan dari stesyen keretapi di tempat anda

- |   |                      |                  |   |                      |                        |
|---|----------------------|------------------|---|----------------------|------------------------|
| 1 | <input type="text"/> | 5.00 - 5.30 pagi | 5 | <input type="text"/> | 7.00 - 7.30 pagi       |
| 2 | <input type="text"/> | 5.30 - 6.00 pagi | 6 | <input type="text"/> | 8.30 - 9.00 pagi       |
| 3 | <input type="text"/> | 6.00 - 6.30 pagi | 7 | <input type="text"/> | Lain-lain,<br>nyatakan |
| 4 | <input type="text"/> | 6.30 - 7.00 pagi |   |                      | .....                  |

29. Masa anda tiba di stesyen yang dituju

- |   |                      |                  |   |                      |                        |
|---|----------------------|------------------|---|----------------------|------------------------|
| 1 | <input type="text"/> | 6.00 - 6.30 pagi | 5 | <input type="text"/> | 8.00 - 8.30 pagi       |
| 2 | <input type="text"/> | 6.30 - 7.00 pagi | 6 | <input type="text"/> | 8.30 - 9.00 pagi       |
| 3 | <input type="text"/> | 7.00 - 7.30 pagi | 7 | <input type="text"/> | 9.00 - 9.30 pagi       |
| 4 | <input type="text"/> | 7.30 - 8.00 pagi | 8 | <input type="text"/> | Lain-lain,<br>nyatakan |
|   |                      |                  |   |                      | .....                  |

30. Masa anda memulakan perjalanan dari stesyen keretapi di tempat kerja untuk pulang.

- |   |                      |                    |   |                      |                        |
|---|----------------------|--------------------|---|----------------------|------------------------|
| 1 | <input type="text"/> | 4.00 - 4.30 petang | 5 | <input type="text"/> | 6.00 - 6.30 petang     |
| 2 | <input type="text"/> | 4.30 - 5.00 petang | 6 | <input type="text"/> | 6.30 - 7.00 petang     |
| 3 | <input type="text"/> | 5.00 - 5.30 petang | 7 | <input type="text"/> | Lain-lain,<br>nyatakan |
| 4 | <input type="text"/> | 5.30 - 6.00 petang |   |                      | .....                  |

31. Masa anda tiba di stesyen di tempat anda tinggal

- |   |                          |                   |   |                          |                              |
|---|--------------------------|-------------------|---|--------------------------|------------------------------|
| 1 | <input type="checkbox"/> | 4.30 - 5.00 malam | 5 | <input type="checkbox"/> | 6.30 - 7.00 malam            |
| 2 | <input type="checkbox"/> | 5.00 - 5.30 malam | 6 | <input type="checkbox"/> | 7.00 - 7.30 malam            |
| 3 | <input type="checkbox"/> | 5.30 - 6.00 malam | 7 | <input type="checkbox"/> | 7.30 - 8.00 malam            |
| 4 | <input type="checkbox"/> | 6.00 - 6.30 malam | 8 | <input type="checkbox"/> | Lain-lain, nyatakan<br>..... |

32. Sebab-sebab anda memilih keretapi untuk membuat perjalanan.  
(Boleh dijawab lebih dari 1).

- |    |                          |                                                                           |
|----|--------------------------|---------------------------------------------------------------------------|
| 1  | <input type="checkbox"/> | Dekat dengan stesyen keretapi.                                            |
| 2  | <input type="checkbox"/> | Saya senang mendapat kenderaan lain untuk sampai ke stesyen keretapi      |
| 3  | <input type="checkbox"/> | Tambang adalah berpatutan                                                 |
| 4  | <input type="checkbox"/> | Keretapi adalah selamat                                                   |
| 5  | <input type="checkbox"/> | Seronok menikmati keindahan alam dalam perjalanan                         |
| 6  | <input type="checkbox"/> | Keselesaan dalam keretapi                                                 |
| 7  | <input type="checkbox"/> | Kemudahan-kemudahan yang menarik dalam keretapi                           |
| 8  | <input type="checkbox"/> | Dapat berkenalan dengan orang-orang baru                                  |
| 9  | <input type="checkbox"/> | Dapat membuat kerja-kerja (membaca, menulis, berbincang) dalam perjalanan |
| 10 | <input type="checkbox"/> | Kakitangan keretapi yang peramah dan baik                                 |
| 11 | <input type="checkbox"/> | Ruang yang luas, anak-anak saya lebih bebas bergerak                      |
| 12 | <input type="checkbox"/> | Tidak ada pilihan lain                                                    |
| 13 | <input type="checkbox"/> | Lain-lain, nyatakan .....                                                 |



33. Sejauh manakah pentingnya perjalanan bagi anda.

- 1    | ☐ |    Tidak penting, tetapi masih membuat perjalanan
- 2    | ☐ |    Penting, tetapi sekali sekala sahaja
- 3    | ☐ |    Penting
- 4    | ☐ |    Sangat penting

### BAHAGIAN III

-----

Bahagian ini memerlukan pendapat responden mengenai tambang dan kualiti perkhidmatan (kemudahan dan layanan) KTM. Sila jawab soalan berikut dengan menandakan (/) dalam kotak-kotak berkenaan atau terangkan di mana-mana yang perlu.

Soalan (34) hingga (38) ialah berhubung dengan tingkat kualiti perkhidmatan pada masa ini.

34. Masa sibuk (peak hour) bagi perkhidmatan PKTM adalah seperti berikut.

Kuala Lumpur, Butterworth dan Singapura/Johor Bharu ialah 6.00 pagi - 8.30 pagi, 12.30 tengahari - 3.00 petang, 5.00 petang - 10 malam.

Ipoh dan Gemas ialah 9.30 pagi - 11.00 pagi, 11.00 malam - 2.00 pagi.

Jika PKTM menawarkan diskaun tambang tertentu dengan syarat anda membuat perjalanan di luar masa sibuk, berapakah diskaun yang anda sanggup mengambilnya.

- |   |                          |                                   |
|---|--------------------------|-----------------------------------|
| 1 | <input type="checkbox"/> | 10% [setiap \$10 dikurangkan \$1] |
| 2 | <input type="checkbox"/> | 15%                               |
| 3 | <input type="checkbox"/> | 20%                               |
| 4 | <input type="checkbox"/> | 25%                               |
| 5 | <input type="checkbox"/> | Tidak perlu diskaun               |



35. Jika PKTM menawarkan diskaun dengan syarat penumpang-penumpang telah pun menggunakan keretapi lebih dari 10 kali dalam masa 12 bulan untuk jarak perjalanan dalam lingkungan 100 km, berapakah diskaun yang anda sanggup mengambilnya.

- 1    | ☐ |    10%
- 2    | ☐ |    15%
- 3    | ☐ |    20%
- 4    | ☐ |    25%
- 5    | ☐ |    Tidak perlu diskaun

36. Jika PKTM menawarkan diskaun dengan syarat penumpang-penumpang telah pun menggunakan keretapi lebih dari 5 kali dalam masa 12 bulan untuk jarak perjalanan melebihi 100 km, berapakah diskaun yang anda sanggup mengambilnya.

- 1    | ☐ |    10%
- 2    | ☐ |    15%
- 3    | ☐ |    20%
- 4    | ☐ |    25%
- 5    | ☐ |    Tidak perlu diskaun

37. Adakah tambang yang anda bayar untuk perjalanan ini berpatutan jika dibandingkan dengan tambang yang dikenakan oleh jenis-jenis pengangkutan yang lain.

- 1    | ☐ |    Ya
- 2    | ☐ |    Tidak

38. Jika PKTM menaikkan tambang antara 50 sen - \$3 (bergantung kepada jarak perjalanan) di samping menyediakan kemudahan-kemudahan seperti memberi surat khabar, minuman ringan dan tempat duduk yang 'guarantee' (bernombor), adakah anda setuju.

- 1    | ☐ |    Ya
- 2    | ☐ |    Tidak

39. PKTM mempunyai rancangan untuk menjalankan perkhidmatan railbus pada tahun hadapan di mana tambangnya hampir sama dengan tambang bas dan perjalanannya lebih laju dari keretapi biasa. Adakah anda akan menggunakan railbus.

1 ☐ Ya

2 ☐ Tidak

40. Pada pendapatan anda berapakah tambang yang berpatutan untuk perjalanan ini (satu arah) dengan tingkat kualiti perkhidmatan yang ada sekarang.

\$ \_\_\_\_\_

Soalan (41 hingga (49) mengkehendaki responden menjawab sama ada mutu kemudahan-kemudahan berikut memuaskan atau tidak.

41. Sistem 'ticketing'

1 ☐ Sangat tidak memuaskan

2 ☐ Tidak memuaskan

3 ☐ Memuaskan tetapi perlu dipertingkatkan

4 ☐ Memuaskan

42. Tempat menunggu di stesyen

1 ☐ Sangat tidak memuaskan

2 ☐ Tidak memuaskan

3 ☐ Memuaskan tetapi perlu dipertingkatkan

4 ☐ Memuaskan



43. Kebersihan dalam keretapi

- 1    ☐ Sangat tidak memuaskan
- 2    ☐ Tidak memuaskan
- 3    ☐ Memuaskan tetapi perlu dipertingkatkan
- 4    ☐ Memuaskan

44. Tempat duduk

- 1    ☐ Sangat tidak memuaskan
- 2    ☐ Tidak memuaskan
- 3    ☐ Memuaskan tetapi perlu dipertingkatkan
- 4    ☐ Memuaskan

45. Tandas dalam keretapi

- 1    ☐ Sangat tidak memuaskan
- 2    ☐ Tidak memuaskan
- 3    ☐ Memuaskan tetapi perlu dipertingkatkan
- 4    ☐ Memuaskan

46. Kakitangan yang bertugas di stesyen

- 1    ☐ Sangat tidak memuaskan
- 2    ☐ Tidak memuaskan
- 3    ☐ Memuaskan tetapi perlu dipertingkatkan
- 4    ☐ Memuaskan

47. Kakitangan yang bertugas dalam keretapi

- 1    ☐    Sangat tidak memuaskan
- 2    ☐    Tidak memuaskan
- 3    ☐    Memuaskan tetapi perlu dipertingkatkan
- 4    ☐    Memuaskan

48. Mutu makanan di kantin dalam keretapi

- 1    ☐    Sangat tidak memuaskan
- 2    ☐    Tidak memuaskan
- 3    ☐    Memuaskan tetapi perlu dipertingkatkan
- 4    ☐    Memuaskan

49. Harga makanan di kantin dalam keretapi

- 1    ☐    Mahal      2    ☐    Sederhana      3    ☐    Murah

50. Bilakah kali terakhir anda melihat iklan PKTM mengenai perkhidmatan-perkhidmatan dan tambang istimewa yang ditawarkan kepada penumpang.

- 1    ☐    Minggu lepas
- 2    ☐    Sebulan yang lepas
- 3    ☐    Beberapa bulan yang lepas
- 4    ☐    Tahun lepas



51. Dimanakah kali terakhir anda melihat iklan seperti di soalan (50).

- 1    ☐    Radio dan TV
- 2    ☐    Suratkhobar/majalah
- 3    ☐    Poster yang dipamirkan di stesyen keretapi
- 4    ☐    Poster yang dipamirkan di tempat-tempat tertentu
- 5    ☐    Papan tanda besar (boarding)
- 6    ☐    Pamiran tertentu
- 7    ☐    Liflet/booklet
- 8    ☐    Lain-lain, nyatakan .....

#### BAHAGIAN IV

Bahagian ini memerlukan responden memeringkatkan jawapan-jawapan untuk tiap-tiap soalan.

##### 52. Tambang/kos

|                              | Paling mahal |   |   | Paling murah |   |
|------------------------------|--------------|---|---|--------------|---|
|                              | 1            | 2 | 3 | 4            | 5 |
| Bas                          |              |   |   |              |   |
| Keretapi                     |              |   |   |              |   |
| Teksi                        |              |   |   |              |   |
| Motokar Kongsi               |              |   |   |              |   |
| Motokar Sendiri<br>(seorang) |              |   |   |              |   |
| Kapalterbang                 |              |   |   |              |   |

##### 53. Kelajuan

|                              | Paling lambat |   |   | Paling cepat |   |
|------------------------------|---------------|---|---|--------------|---|
|                              | 1             | 2 | 3 | 4            | 5 |
| Bas                          |               |   |   |              |   |
| Keretapi                     |               |   |   |              |   |
| Teksi                        |               |   |   |              |   |
| Motokar Kongsi               |               |   |   |              |   |
| Motokar Sendiri<br>(seorang) |               |   |   |              |   |
| Kapalterbang                 |               |   |   |              |   |



54. Masa purata menunggu

|                | Paling lama |   |   | Paling cepat |   |
|----------------|-------------|---|---|--------------|---|
|                | 1           | 2 | 3 | 4            | 5 |
| Bas            |             |   |   |              |   |
| Keretapi       |             |   |   |              |   |
| Teksi          |             |   |   |              |   |
| Motokar Kongsi |             |   |   |              |   |
| Kapalterbang   |             |   |   |              |   |

55. Purata jumlah perkhidmatan (kekerapan)

|                | Paling sedikit |   |   | Paling banyak |   |
|----------------|----------------|---|---|---------------|---|
|                | 1              | 2 | 3 | 4             | 5 |
| Bas            |                |   |   |               |   |
| Keretapi       |                |   |   |               |   |
| Teksi          |                |   |   |               |   |
| Motokar Kongsi |                |   |   |               |   |
| Kapalterbang   |                |   |   |               |   |

56. Kesselesaian dalam perjalanan

|                              | Paling Tidak Memuaskan |   |   | Paling Baik |   |
|------------------------------|------------------------|---|---|-------------|---|
|                              | 1                      | 2 | 3 | 4           | 5 |
| Bas                          |                        |   |   |             |   |
| Keretapi                     |                        |   |   |             |   |
| Teksi                        |                        |   |   |             |   |
| Motokar Kongsi               |                        |   |   |             |   |
| Motokar Sendiri<br>(seorang) |                        |   |   |             |   |
| Kapalterbang                 |                        |   |   |             |   |

57. Sistem tiket

|              | Paling mengelirukan |   |   | Paling mudah |   |
|--------------|---------------------|---|---|--------------|---|
|              | 1                   | 2 | 3 | 4            | 5 |
| Bas          |                     |   |   |              |   |
| Keretapi     |                     |   |   |              |   |
| Teksi        |                     |   |   |              |   |
| Kapalterbang |                     |   |   |              |   |



58. Peluang membuat kerja dalam perjalanan (termasuk membaca dan berbincang).

|                | Paling sedikit |   |   | Paling banyak |   |
|----------------|----------------|---|---|---------------|---|
|                | 1              | 2 | 3 | 4             | 5 |
| Bas            |                |   |   |               |   |
| Keretapi       |                |   |   |               |   |
| Teksi          |                |   |   |               |   |
| Motokar Kongsi |                |   |   |               |   |
| Kapalterbang   |                |   |   |               |   |

59. Layanan dari kakitangan

|              | Paling tidak memuaskan |   |   | Paling baik |   |
|--------------|------------------------|---|---|-------------|---|
|              | 1                      | 2 | 3 | 4           | 5 |
| Bas          |                        |   |   |             |   |
| Keretapi     |                        |   |   |             |   |
| Teksi        |                        |   |   |             |   |
| Kapalterbang |                        |   |   |             |   |

60. Menikmati keindahan alam dalam perjalanan

|                              | Paling Tidak Seronok |   |   | Paling Seronok |   |
|------------------------------|----------------------|---|---|----------------|---|
|                              | 1                    | 2 | 3 | 4              | 5 |
| Bas                          |                      |   |   |                |   |
| Keretapi                     |                      |   |   |                |   |
| Teksi                        |                      |   |   |                |   |
| Motokar Kongsi               |                      |   |   |                |   |
| Motokar Sendiri<br>(seorang) |                      |   |   |                |   |
| Kapalterbang                 |                      |   |   |                |   |

61. Keselamatan

|                              | Paling Tidak Selamat |   |   | Paling Selamat |   |
|------------------------------|----------------------|---|---|----------------|---|
|                              | 1                    | 2 | 3 | 4              | 5 |
| Bas                          |                      |   |   |                |   |
| Keretapi                     |                      |   |   |                |   |
| Teksi                        |                      |   |   |                |   |
| Motokar Kongsi               |                      |   |   |                |   |
| Motokar Sendiri<br>(seorang) |                      |   |   |                |   |
| Kapalterbang                 |                      |   |   |                |   |



62. Pendapat secara keseluruhan. Peringkatkan jawapan berikut mengikut mode mana yang paling anda suka untuk perjalanan anda.

|                              | Paling Tidak Memuaskan |   |   | Paling Baik |   |
|------------------------------|------------------------|---|---|-------------|---|
|                              | 1                      | 2 | 3 | 4           | 5 |
| Bas                          |                        |   |   |             |   |
| Keretapi                     |                        |   |   |             |   |
| Teksi                        |                        |   |   |             |   |
| Motokar Kongsi               |                        |   |   |             |   |
| Motokar Sendiri<br>(seorang) |                        |   |   |             |   |
| Kapalterbang                 |                        |   |   |             |   |

63. Pendapat secara keseluruhan. Peringkatkan jawapan berikut mengikut mode mana yang paling anda suka untuk perjalanan anda.

|                              | Paling Tidak Memuaskan |   |   | Paling Baik |   |
|------------------------------|------------------------|---|---|-------------|---|
|                              | 1                      | 2 | 3 | 4           | 5 |
| Bas                          |                        |   |   |             |   |
| Keretapi                     |                        |   |   |             |   |
| Teksi                        |                        |   |   |             |   |
| Motokar Kongsi               |                        |   |   |             |   |
| Motokar Sendiri<br>(seorang) |                        |   |   |             |   |
| Kapalterbang                 |                        |   |   |             |   |

**APPENDIX F-1**  
**MR – OCCUPANCY RATE OF PASSENGER SERVICE 1987**  
**(NORTH-BOUND)**

Kuala Lumpur – Butterworth

| <i>Time &amp; Service Type</i> | <i><math>\frac{N^o \text{ of seats occupied}}{N^o \text{ of seats available}}</math></i> |                       |   |   |   |                     |   |   |
|--------------------------------|------------------------------------------------------------------------------------------|-----------------------|---|---|---|---------------------|---|---|
| Rakyat Express                 | A                                                                                        | B                     | C | D | E | G                   | H | I |
| Mon-Thurs. (Av)                | $\frac{876}{2432}$                                                                       | $\frac{162}{832}$     |   |   |   | $\frac{82}{208}$    |   |   |
| Fri-Sun. (Av)                  | $\frac{744}{1824}$                                                                       | $\frac{86}{624}$      |   |   |   | $\frac{104}{156}$   |   |   |
| <i>Average for quarter:</i>    |                                                                                          |                       |   |   |   |                     |   |   |
| January-March                  | $\frac{7032}{55328}$                                                                     | $\frac{3674}{18720}$  |   |   |   | $\frac{748}{4680}$  |   |   |
| April-June                     | $\frac{13840}{55936}$                                                                    | $\frac{13036}{19163}$ |   |   |   | $\frac{1040}{4888}$ |   |   |
| July-September                 | $\frac{11786}{55328}$                                                                    | $\frac{14428}{18720}$ |   |   |   | $\frac{1222}{4680}$ |   |   |
| October-December               | $\frac{20428}{55936}$                                                                    | $\frac{16220}{19163}$ |   |   |   | $\frac{1856}{4992}$ |   |   |
| <i>Public Holidays:</i>        |                                                                                          |                       |   |   |   |                     |   |   |
| Hari Raya Puasa                | $\frac{642}{1216}$                                                                       | $\frac{196}{416}$     |   |   |   | $\frac{62}{104}$    |   |   |
| Chinese New Year               | $\frac{448}{1216}$                                                                       | $\frac{206}{416}$     |   |   |   | $\frac{84}{104}$    |   |   |
| Other public holiday           | $\frac{3884}{4864}$                                                                      | $\frac{1042}{1664}$   |   |   |   | $\frac{238}{416}$   |   |   |

Data is average for two flows, 1 service

**KEY:**

|   |   |                               |   |   |                                       |
|---|---|-------------------------------|---|---|---------------------------------------|
| A | - | Third class                   | E | - | Second class berth (lowerbed)         |
| B | - | Second class ordinary         | G | - | First class, airconditioned           |
| C | - | Second class airconditioned   | H | - | First class, cabin non-airconditioned |
| D | - | Second class berth (upperbed) | I | - | First class, cabin airconditioned     |



Kuala Lumpur – Butterworth

| Time & Service Type  | $\frac{N^{\circ} \text{ of seats occupied}}{N^{\circ} \text{ of seats available}}$ |                      |                       |   |   |                    |   |   |
|----------------------|------------------------------------------------------------------------------------|----------------------|-----------------------|---|---|--------------------|---|---|
|                      | A                                                                                  | B                    | C                     | D | E | G                  | H | I |
| Sinaran Pagi         |                                                                                    |                      |                       |   |   |                    |   |   |
| Mon-Thurs. (Av)      |                                                                                    | <u>240</u><br>512    | <u>314</u><br>1664    |   |   | <u>144</u><br>208  |   |   |
| Fri-Sun. (Av)        |                                                                                    | <u>300</u><br>384    | <u>390</u><br>1248    |   |   | <u>82</u><br>156   |   |   |
| Average for quarter: |                                                                                    |                      |                       |   |   |                    |   |   |
| January-March        |                                                                                    | <u>1724</u><br>11648 | <u>24208</u><br>37856 |   |   | <u>196</u><br>4732 |   |   |
| April-June           |                                                                                    | <u>6922</u><br>11904 | <u>32482</u><br>38272 |   |   | <u>324</u><br>4836 |   |   |
| July-September       |                                                                                    | <u>1840</u><br>11648 | <u>20608</u><br>37856 |   |   | <u>280</u><br>4732 |   |   |
| October-December     |                                                                                    | <u>7724</u><br>11904 | <u>36228</u><br>38272 |   |   | <u>360</u><br>4836 |   |   |
| Public Holidays:     |                                                                                    |                      |                       |   |   |                    |   |   |
| Hari Raya Puasa      |                                                                                    | <u>184</u><br>256    | <u>208</u><br>832     |   |   | <u>82</u><br>104   |   |   |
| Chinese New Year     |                                                                                    | <u>162</u><br>256    | <u>448</u><br>832     |   |   | <u>78</u><br>104   |   |   |
| Other public holiday |                                                                                    | <u>960</u><br>1024   | <u>2640</u><br>3328   |   |   | <u>398</u><br>416  |   |   |

Kuala Lumpur – Butterworth

| <i>Time &amp; Service Type</i> | <i><math>\frac{N^{\circ} \text{ of seats occupied}}{N^{\circ} \text{ of seats available}}</math></i> |                       |          |          |          |          |          |          |
|--------------------------------|------------------------------------------------------------------------------------------------------|-----------------------|----------|----------|----------|----------|----------|----------|
| Day Mail Train                 | <i>A</i>                                                                                             | <i>B</i>              | <i>C</i> | <i>D</i> | <i>E</i> | <i>G</i> | <i>H</i> | <i>I</i> |
| Mon-Thurs. (Av)                | <u>3940</u><br>4256                                                                                  | <u>922</u><br>1024    |          |          |          |          |          |          |
| Fri-Sun. (Av)                  | <u>2722</u><br>3192                                                                                  | <u>598</u><br>768     |          |          |          |          |          |          |
| <i>Average for quarter:</i>    |                                                                                                      |                       |          |          |          |          |          |          |
| January-March                  | <u>21422</u><br>96824                                                                                | <u>19722</u><br>23296 |          |          |          |          |          |          |
| April-June                     | <u>25208</u><br>97280                                                                                | <u>17528</u><br>23680 |          |          |          |          |          |          |
| July-September                 | <u>38608</u><br>96824                                                                                | <u>19348</u><br>23296 |          |          |          |          |          |          |
| October-December               | <u>53414</u><br>97280                                                                                | <u>21782</u><br>23680 |          |          |          |          |          |          |
| <i>Public Holidays:</i>        |                                                                                                      |                       |          |          |          |          |          |          |
| Hari Raya Puasa                | <u>1492</u><br>1720                                                                                  | <u>368</u><br>384     |          |          |          |          |          |          |
| Chinese New Year               | <u>1414</u><br>1720                                                                                  | <u>354</u><br>384     |          |          |          |          |          |          |
| Other public holiday           | <u>7494</u><br>8512                                                                                  | <u>2008</u><br>2048   |          |          |          |          |          |          |



Kuala Lumpur – Butterworth

| <i>Time &amp; Service Type</i> | <div> <i>N° of seats occupied</i><br/> <i>N° of seats available</i> </div> |                       |   |                       |   |   |                     |                     |
|--------------------------------|----------------------------------------------------------------------------|-----------------------|---|-----------------------|---|---|---------------------|---------------------|
| Night Sleeper                  | A                                                                          | B                     | C | D                     | E | G | H                   | I                   |
| Mon-Thurs. (Av)                |                                                                            | <u>648</u><br>992     |   | <u>682</u><br>992     |   |   | <u>56</u><br>112    | <u>30</u><br>128    |
| Fri-Sun. (Av)                  |                                                                            | <u>546</u><br>744     |   | <u>548</u><br>744     |   |   | <u>78</u><br>84     | <u>22</u><br>96     |
| <i>Average for quarter:</i>    |                                                                            |                       |   |                       |   |   |                     |                     |
| January-March                  |                                                                            | <u>1748</u><br>22320  |   | <u>18428</u><br>22320 |   |   | <u>2008</u><br>2548 | <u>922</u><br>2912  |
| April-June                     |                                                                            | <u>1892</u><br>22440  |   | <u>17420</u><br>22440 |   |   | <u>1960</u><br>2660 | <u>742</u><br>3040  |
| July-September                 |                                                                            | <u>4824</u><br>22320  |   | <u>20828</u><br>22320 |   |   | <u>1720</u><br>2548 | <u>1968</u><br>2912 |
| October-December               |                                                                            | <u>18836</u><br>22440 |   | <u>20742</u><br>22440 |   |   | <u>2420</u><br>2660 | <u>1942</u><br>3040 |
| <i>Public Holidays:</i>        |                                                                            |                       |   |                       |   |   |                     |                     |
| Hari Raya Puasa                |                                                                            | <u>428</u><br>496     |   | <u>448</u><br>496     |   |   | <u>42</u><br>56     | <u>238</u><br>256   |
| Chinese New Year               |                                                                            | <u>482</u><br>496     |   | <u>392</u><br>496     |   |   | <u>48</u><br>56     | <u>198</u><br>256   |
| Other public holiday           |                                                                            | <u>1792</u><br>1984   |   | <u>1588</u><br>1984   |   |   | <u>38</u><br>56     | <u>48</u><br>64     |

Kuala Lumpur – Butterworth

| Time & Service Type  | $\frac{N^{\circ} \text{ of seats occupied}}{N^{\circ} \text{ of seats available}}$ |                       |   |   |   |   |   |   |
|----------------------|------------------------------------------------------------------------------------|-----------------------|---|---|---|---|---|---|
|                      | A                                                                                  | B                     | C | D | E | G | H | I |
| Night Mail Train     |                                                                                    |                       |   |   |   |   |   |   |
| Mon-Thurs. (Av)      | <u>2612</u><br>4256                                                                | <u>628</u><br>1024    |   |   |   |   |   |   |
| Fri-Sun. (Av)        | <u>2188</u><br>3192                                                                | <u>482</u><br>768     |   |   |   |   |   |   |
| Average for quarter: |                                                                                    |                       |   |   |   |   |   |   |
| January-March        | <u>24920</u><br>95760                                                              | <u>14008</u><br>23040 |   |   |   |   |   |   |
| April-June           | <u>30942</u><br>97280                                                              | <u>16432</u><br>23168 |   |   |   |   |   |   |
| July-September       | <u>61482</u><br>95760                                                              | <u>18820</u><br>23040 |   |   |   |   |   |   |
| October-December     | <u>76922</u><br>97280                                                              | <u>18456</u><br>23168 |   |   |   |   |   |   |
| Public Holidays:     |                                                                                    |                       |   |   |   |   |   |   |
| Hari Raya Puasa      | <u>2622</u><br>3040                                                                | <u>280</u><br>768     |   |   |   |   |   |   |
| Chinese New Year     | <u>2528</u><br>3040                                                                | <u>392</u><br>768     |   |   |   |   |   |   |
| Other public holiday | <u>10402</u><br>12160                                                              | <u>2640</u><br>3072   |   |   |   |   |   |   |



**APPENDIX F-2**  
**MR – OCCUPANCY RATE OF PASSENGER SERVICE 1987**  
**(SOUTH-BOUND)**

Kuala Lumpur – Singapore

| <i>Time &amp; Service Type</i> | <i>N<sup>o</sup> of seats occupied</i><br><i>N<sup>o</sup> of seats available</i> |                       |   |   |   |                     |   |   |  |
|--------------------------------|-----------------------------------------------------------------------------------|-----------------------|---|---|---|---------------------|---|---|--|
| Rakyat Express                 | A                                                                                 | B                     | C | D | E | G                   | H | I |  |
| Mon-Thurs. (Av)                | <u>871</u><br>2432                                                                | <u>143</u><br>832     |   |   |   | <u>73</u><br>208    |   |   |  |
| Fri-Sun. (Av)                  | <u>645</u><br>1824                                                                | <u>90</u><br>624      |   |   |   | <u>89</u><br>156    |   |   |  |
| <i>Average for quarter:</i>    |                                                                                   |                       |   |   |   |                     |   |   |  |
| January-March                  | <u>16166</u><br>55328                                                             | <u>11564</u><br>18720 |   |   |   | <u>120</u><br>4680  |   |   |  |
| April-June                     | <u>32591</u><br>55936                                                             | <u>11827</u><br>19163 |   |   |   | <u>3264</u><br>4888 |   |   |  |
| July-September                 | <u>38209</u><br>55328                                                             | <u>14881</u><br>18720 |   |   |   | <u>3998</u><br>4680 |   |   |  |
| October-December               | <u>44965</u><br>55936                                                             | <u>16115</u><br>19163 |   |   |   | <u>4451</u><br>4992 |   |   |  |
| <i>Public Holidays:</i>        |                                                                                   |                       |   |   |   |                     |   |   |  |
| Hari Raya Puasa                | <u>347</u><br>1216                                                                | <u>205</u><br>416     |   |   |   | <u>55</u><br>104    |   |   |  |
| Chinese New Year               | <u>854</u><br>1216                                                                | <u>222</u><br>416     |   |   |   | <u>73</u><br>104    |   |   |  |
| Other public holiday           | <u>3115</u><br>4864                                                               | <u>1467</u><br>1664   |   |   |   | <u>386</u><br>416   |   |   |  |

Kuala Lumpur – Singapore

| Time & Service Type  | <i>Nº of seats occupied</i><br><i>Nº of seats available</i> |                      |                       |   |   |                     |   |   |
|----------------------|-------------------------------------------------------------|----------------------|-----------------------|---|---|---------------------|---|---|
|                      | A                                                           | B                    | C                     | D | E | G                   | H | I |
| Sinaran Pagi         |                                                             |                      |                       |   |   |                     |   |   |
| Mon-Thurs. (Av)      |                                                             | <u>333</u><br>512    | <u>876</u><br>1664    |   |   | <u>124</u><br>208   |   |   |
| Fri-Sun. (Av)        |                                                             | <u>331</u><br>384    | <u>716</u><br>1248    |   |   | <u>82</u><br>156    |   |   |
| Average for quarter: |                                                             |                      |                       |   |   |                     |   |   |
| January-March        |                                                             | <u>3945</u><br>11648 | <u>25151</u><br>37856 |   |   | <u>2312</u><br>4732 |   |   |
| April-June           |                                                             | <u>6755</u><br>11904 | <u>31608</u><br>38272 |   |   | <u>1161</u><br>4836 |   |   |
| July-September       |                                                             | <u>4620</u><br>11648 | <u>28506</u><br>37856 |   |   | <u>1944</u><br>4732 |   |   |
| October-December     |                                                             | <u>8913</u><br>11904 | <u>36665</u><br>38272 |   |   | <u>2208</u><br>4836 |   |   |
| Public Holidays:     |                                                             |                      |                       |   |   |                     |   |   |
| Hari Raya Puasa      |                                                             | <u>219</u><br>256    | <u>506</u><br>832     |   |   | <u>77</u><br>104    |   |   |
| Chinese New Year     |                                                             | <u>211</u><br>256    | <u>632</u><br>832     |   |   | <u>72</u><br>104    |   |   |
| Other public holiday |                                                             | <u>898</u><br>1024   | <u>2727</u><br>3328   |   |   | <u>217</u><br>416   |   |   |



Kuala Lumpur – Singapore

| Time & Service Type  | <i>N<sup>o</sup> of seats occupied</i><br><i>N<sup>o</sup> of seats available</i> |                      |   |   |   |   |   |   |
|----------------------|-----------------------------------------------------------------------------------|----------------------|---|---|---|---|---|---|
|                      | A                                                                                 | B                    | C | D | E | G | H | I |
| Day Mail Train       |                                                                                   |                      |   |   |   |   |   |   |
| Mon-Thurs. (Av)      | <u>583</u><br>4256                                                                | <u>137</u><br>1024   |   |   |   |   |   |   |
| Fri-Sun. (Av)        | <u>983</u><br>3192                                                                | <u>156</u><br>768    |   |   |   |   |   |   |
| Average for quarter: |                                                                                   |                      |   |   |   |   |   |   |
| January-March        | <u>20541</u><br>96824                                                             | <u>1678</u><br>23296 |   |   |   |   |   |   |
| April-June           | <u>35947</u><br>97280                                                             | <u>3016</u><br>23680 |   |   |   |   |   |   |
| July-September       | <u>41991</u><br>96824                                                             | <u>2182</u><br>23296 |   |   |   |   |   |   |
| October-December     | <u>38051</u><br>97280                                                             | <u>2143</u><br>23680 |   |   |   |   |   |   |
| Public Holidays:     |                                                                                   |                      |   |   |   |   |   |   |
| Hari Raya Puasa      | <u>842</u><br>1720                                                                | <u>415</u><br>384    |   |   |   |   |   |   |
| Chinese New Year     | <u>928</u><br>1720                                                                | <u>379</u><br>384    |   |   |   |   |   |   |
| Other public holiday | <u>7002</u><br>8512                                                               | <u>1873</u><br>2048  |   |   |   |   |   |   |

Kuala Lumpur – Singapore

| Time & Service Type  | <div> <i>Nº of seats occupied</i><br/> <i>Nº of seats available</i> </div> |                       |   |                       |   |   |                     |                     |
|----------------------|----------------------------------------------------------------------------|-----------------------|---|-----------------------|---|---|---------------------|---------------------|
|                      | A                                                                          | B                     | C | D                     | E | G | H                   | I                   |
| Night Sleeper        |                                                                            |                       |   |                       |   |   |                     |                     |
| Mon-Thurs. (Av)      |                                                                            | <u>645</u><br>1240    |   | <u>702</u><br>1116    |   |   | <u>69</u><br>112    | <u>39</u><br>128    |
| Fri-Sun. (Av)        |                                                                            | <u>534</u><br>930     |   | <u>535</u><br>746     |   |   | <u>63</u><br>84     | <u>33</u><br>96     |
| Average for quarter: |                                                                            |                       |   |                       |   |   |                     |                     |
| January-March        |                                                                            | <u>1868</u><br>27900  |   | <u>10188</u><br>27900 |   |   | <u>1950</u><br>2548 | <u>1702</u><br>2912 |
| April-June           |                                                                            | <u>10967</u><br>28020 |   | <u>19021</u><br>28020 |   |   | <u>1856</u><br>2660 | <u>1475</u><br>3040 |
| July-September       |                                                                            | <u>12352</u><br>27900 |   | <u>20826</u><br>27900 |   |   | <u>1806</u><br>2548 | <u>1988</u><br>2912 |
| October-December     |                                                                            | <u>19789</u><br>28020 |   | <u>20117</u><br>28020 |   |   | <u>2204</u><br>2660 | <u>2343</u><br>3040 |
| Public Holidays:     |                                                                            |                       |   |                       |   |   |                     |                     |
| Hari Raya Puasa      |                                                                            | <u>408</u><br>558     |   | <u>458</u><br>558     |   |   | <u>47</u><br>56     | <u>221</u><br>256   |
| Chinese New Year     |                                                                            | <u>423</u><br>558     |   | <u>402</u><br>558     |   |   | <u>48</u><br>56     | <u>193</u><br>256   |
| Other public holiday |                                                                            | <u>1788</u><br>2232   |   | <u>1670</u><br>2232   |   |   | <u>42</u><br>56     | <u>48</u><br>64     |



Kuala Lumpur – Singapore

| Time & Service Type         | <i>Nº of seats occupied</i><br><i>Nº of seats available</i> |                       |   |   |   |   |   |   |
|-----------------------------|-------------------------------------------------------------|-----------------------|---|---|---|---|---|---|
|                             | A                                                           | B                     | C | D | E | G | H | I |
| Night Mail Train            |                                                             |                       |   |   |   |   |   |   |
| Mon-Thurs. (Av)             | <u>2270</u><br>4256                                         | <u>814</u><br>1024    |   |   |   |   |   |   |
| 2488<br>Fri-Sun. (Av)       | <u>2188</u><br>3192                                         | <u>520</u><br>768     |   |   |   |   |   |   |
| <i>Average for quarter:</i> |                                                             |                       |   |   |   |   |   |   |
| January-March               | <u>30212</u><br>95760                                       | <u>14981</u><br>23040 |   |   |   |   |   |   |
| April-June                  | <u>35124</u><br>97280                                       | <u>18263</u><br>23168 |   |   |   |   |   |   |
| July-September              | <u>57212</u><br>95760                                       | <u>21527</u><br>23040 |   |   |   |   |   |   |
| October-December            | <u>76189</u><br>97280                                       | <u>20943</u><br>23168 |   |   |   |   |   |   |
| <i>Public Holidays:</i>     |                                                             |                       |   |   |   |   |   |   |
| Hari Raya Puasa             | <u>2752</u><br>3040                                         | <u>414</u><br>768     |   |   |   |   |   |   |
| Chinese New Year            | <u>2385</u><br>3040                                         | <u>563</u><br>768     |   |   |   |   |   |   |
| Other public holiday        | <u>10168</u><br>12160                                       | <u>2850</u><br>3072   |   |   |   |   |   |   |

# APPENDIX G

## ABSTRACTS OF PREVIOUS WORKS ON FARE ELASTICITY OF DEMAND ESTIMATES

### 1. Evidence from Transit Operating Statistics

Data was collected from ridership statistics of actual fare changes and calculations were made in order to see the effect of those changes on demand and revenue. The problem arising from this method is that one has no evidence of the effect of seasonal variations, weather effects, the secular trend, variations in supply, or service adjustments which often accompany fare increases as a matter of operating policy.

#### 1.1 Simpson & Curtin (1968).

Data from 1940's to 1968 were used to see how much ridership was lost when fares increased in transit systems throughout the USA (in this case bus fares). The result from the analysis was a shrinkage ratio of -0.33, which means for every 1% increase in fare, ridership reduced by .33 of 1% and revenue increased by 106.7%. This result became known as "Curtin's Rule" and until today it is in use throughout the United States.

#### 1.2 Schneider (1965).

Los Angeles was one of the first cities in 1961 which introduced the concession fare called senior citizen privilege card for travel outside peak hours. From a survey taken among card-holders during the early months of the scheme, it was calculated that the shrinkage ratio was about -0.7.

#### 1.3 Cantor (1970).

In the New York City Authority System for rapid transit and surface lines (both bus and rail) a series of experiments on increasing fares in 1969 resulted in a shrinkage ratio of about -0.5.



#### **1.4 London Transport - National Board for Prices and Incomes (1968)**

London Transport's ex ante assessment of bus fare increases in Autumn 1968 stated that an average 14% rise in fares would lead to a 6% fall in passenger journeys, which gave an overall shrinkage ratio of about -0.4.

### **2. Evidence from the Analysis of Operating Data Time Series**

In this method, data were gathered on ridership, gross revenue, and vehicle mileage for one city, together with demographic and socio-economic variables for each year. Then by using multiple regression techniques, the analysis attempted to explain longitudinal variation in riding habit in terms of supply factors, economic climate factors, the price factor and competitive factors.

#### **2.1 Rainville (1948).**

Analysis of longitudinal ridership data for a bus service was carried out in the late 1940's by the statistical laboratory of the Massachusetts Institute of Technology. In this experiment, "Data was taken for each year from 1920 through to 1946 in order to determine the effect of proposed future changes in fares or services standards against any economic or competitive background." At the end of 1946 the system-wide mean fare was increased from 8.75c to 9.8c. This study involved three models:

Model A - gave fare elasticity of -0.1. This model resulted with very low elasticity because it deflated the average fare for each year by a measure of purchasing power. Models B and C - gave the point elasticity between -0.6 to -0.9.

#### **2.2 Carstens & Csanyi (1968).**

This study also used longitudinal ridership statistics. They analysed data from 13 bus companies in Iowa covering 114 annual operating period between 1955 and 1965 with 30



actual fare changes. The authors (Carstens and Csanyi) developed a regression equation which from that the model appears to imply a point fare elasticity between -0.8 and -0.9.

### **3. Evidence from Transit Demonstration Projects**

Transit demonstration project – it was an experimentation with changed fares in the USA. The programme of demonstration projects is federally supported under section 6(a) of 1964 and 1971 Urban Mass Transportation Act.

#### **3.1 Schroeder (1954).**

A short-term experiment designed by Chicago Transit Authority for bus was conducted on four successive Tuesdays in 1953. The fare (flat fare) was reduced from 20c to 10c for travel between 9.30am and 1.30pm result was that ridership increased by about 6% with an implied shrinkage ratio of about -0.12.

#### **3.2 Eastern Massachusetts Street Railway Company**

The Boston & Maine (a railway company), and Lowell Massachusset (Bus Co.) had conducted the reduction fare experiment between August 1963 and March 1964 - they offered a common one-way off-peak fare schedule between Boston and 30 miles northern of city. The result was that the bus fare implied a shrinkage ratio of -0.6 while rail traffic appeared to be less elastic (no exact number of elasticity was mentioned in the article).

#### **3.3 Maloney (1964).**

In the early 1960's, 35 different experiments were carried out in certain cities in the USA on new services frequency and fare changes on a number of rail and bus lines. the result generally confirms two generalisations, which are:

- Ridership volumes are consistently more sensitive to service changes than to fare changes.



- At constant fare, service improvements of the type tested can significantly increase ridership.

#### **4. Evidence from cross-sectional models of modal choice**

##### **4.1 Warner (1962).**

He used 1956 data from a survey in Cook County, Illinois to focus on the binary choice between automobile and mass-transit for the journey to work downtown. His findings were:

- Elasticity of transit usage with respect to transit fare -0.96.
- Elasticity of auto usage with respect to transit fare -0.21.

the above example shows the cross-elasticity of auto demand with respect to transit fare, and summarises the degrees to which people can be diverted into or out of the cars by changing the money price of public transport modes.

#### **5. Evidence from work by Goodwin (1988)**

##### **5.1 Bamford (1984)**

Rail elasticities for work and school trips in West Midlands derived from a cross section mode choice model. Figures were sensitive to model assumptions, giving -0.46 or -0.53 if only train fares changed, and figures ranging from -0.15 for train/bus transfer, to -1.5 for train/car transfer if both train and bus fares changed together.

##### **5.2 British Rail (unpublished).**

British Rail has carried out a number of internal studies which remain unpublished because of commercial confidentiality. These suggest that saver tickets have a high elasticity, perhaps in the region of -1.4, with leisure travel being much more sensitive than business and

commuting. There is an expectation, not yet certain, that inter-urban provincial routes are likely to have elasticities approaching -1.0.

**5.3 Bureau Goudappel Coffenq (1988), Netherland**

Time series and panel analysis of bus, tram and metro fare elasticities, Netherlands, 1981-1987. Static elasticities measured by passenger counts ranged from -0.32 for rural areas up to -0.42 for large cities: measured by ticket revenue (including switching) the figure was -0.45.

**5.4 Cervero (1985)**

Unlagged time series regression of transit ridership in Cincinnati, 1971-83.

|                                            | Elasticity |
|--------------------------------------------|------------|
| 1971-83 total ridership w.r.t. peak fares  | -0.13      |
| 1980-83 total ridership w.r.t. fares, peak | -0.31      |
| off peak                                   | -0.69      |

**5.5 Hensher et al (1986)**

Direct fare elasticity for long distance rail in Australia of -0.89, for non-business travel.

**5.6 Jones et al (1983)**

Unlagged time series of separate London based inter city BR flows, 1970-76.

|                              | Elasticity     |
|------------------------------|----------------|
| BR demand w.r.t. fares: mean | -0.69          |
| range                        | -0.11 to -1.18 |
| (most in range               | -0.6 to -0.8)  |

**5.7 Mackett (1985)**

Similar model applied to rail journeys to work from Herefordshire to London, if 25% rail fare increase 1981 held constant to 1986.



### Change in Rail Use

|             | <i>to centre</i> | <i>to inner London</i> |
|-------------|------------------|------------------------|
| Letchworth  | -23.2            | -44.6                  |
| Hitchin     | -20.2            | -43.2                  |
| Stevenage   | -20.3            | -43.1                  |
| Welwyn      | -13.9            | -42.0                  |
| Hatfield    | -3.8             | -32.5                  |
| Potters Bar | +1.5             | -31.0                  |

Equivalent to overall journey to work by rail elasticity of -0.7 (-0.4 to centre, -1.5 to inner, -1.1 other destinations). Includes effect of moving closer (hence Potters bar result).

#### 5.8 Oldfield et al (1981)

Unlagged time series analysis of BR data 1971-1978 for flows between 140 towns and London. Gave elasticity with respect to season ticket prices of -0.5; cheap day tickets -0.65; full fare tickets -0.20. Results were quite sensitive to model specification. In particular, first class ticket elasticities estimated by Box Jenkins procedure ranged from -0.76 to -0.92, but by regression analysis from -0.11 to -0.20.

#### 5.9 Owen et al (1987)

Analysis of British Rail ticket sales, 1973-1974, for twenty London based intercity flows, overlapping with the analysis by Jones and Nichols. Short term elasticity overall was 0.69, (varying from -0.4 to -0.76) and long term elasticity -1.08 (varying from -0.61 to -1.38). First class trips were slightly less, and second class journeys slightly more, elastic.

#### 5.10 Webster et al (1980)

The famous "black book" - survey of 352 references mainly up to about 1978.

|                                         |                 |
|-----------------------------------------|-----------------|
| Bus demand w.r.t. fare                  | -0.3            |
| range                                   | -0.1 to -0.7    |
| Rail demand w.r.t. fare (10 references) | -0.13 to 0-1.81 |

**APPENDIX H-1**  
**ELASTICITY MEASUREMENTS RAIL OR RAIL/BUS URBAN-SERVICES 1970-1988**

| Year | Place         | Mode             | Elasticity                   | Researcher/Writer – Notes and Comments                                                            |
|------|---------------|------------------|------------------------------|---------------------------------------------------------------------------------------------------|
| 1970 | New York City | Bus & Rail       | -0.50                        | CANTOR                                                                                            |
| 1971 | Paris         | Metro            | -0.20                        | ECMT                                                                                              |
| 1972 | Boston        | Rail             | -0.19                        | KRAFT & DOMERICH<br>- Work Trip<br>- Shopping Trip                                                |
| 1973 | USA           | Rail             | -0.70<br>-0.86<br>-0.31      | New York (all hours)<br>San Francisco (peak)<br>Boston (off-peak)<br>KEMP average at -0.1 to -0.7 |
|      | London        | Rail             | -0.13                        | London (all hours)                                                                                |
| 1979 | Chicago       | Rail             | -1.80                        | PUTCHER et al, non-captive travellers                                                             |
| 1979 | Sydney        | Rail             | -0.27<br>-0.48               | HENSHER et al<br>Excluding rail captives                                                          |
| 1980 | London        | Rail             | -1.0<br>-0.7<br>-0.2 to -0.4 | Reduced fare<br>Full fare<br>Season ticket                                                        |
| 1981 | Collected     | Rail<br>Commuter | -0.17 ± 0.05<br>-0.31        | LAGO et al<br>LAGO et al                                                                          |



APPENDIX H-1 (CONTD.)

| Year | Place         | Mode       | Elasticity    | Researcher/Writer - Notes and Comments |
|------|---------------|------------|---------------|----------------------------------------|
| 1982 | London        | Rail       | -0.25         | Trip between 1 to 3 miles              |
|      | London        | Rail       | -0.60         | Trip more than 3 miles                 |
| 1984 | West Midlands | Bus & Rail | -0.1 to -0.25 | NASH                                   |
| 1985 | Cincinnati    | Bus & Rail | -0.46         | Train fare changes                     |
|      |               |            | -0.15         | Train-bus transfer                     |
| 1986 | Philadelphia  | Bus & Rail | -0.31         | Peak                                   |
|      |               |            | -0.69         | Off-peak                               |
| 1988 | Netherland    | Bus & Rail | -0.23         |                                        |
|      |               |            | -0.37         | Short-term                             |
|      |               |            | -0.74         | Long-term                              |

Note:

- (i) The range is between -0.1 to -1.80
- (ii) Most in the range of -0.1 to -0.4
- (iii) The highest frequency is -0.2

**APPENDIX H-2**  
**ELASTICITY MEASUREMENTS RAIL OR RAIL/BUS INTER-URBAN SERVICES 1976-1987**

| Year | Place            | Mode       | Elasticity     | Researcher/Writer - Notes and Comments                    |
|------|------------------|------------|----------------|-----------------------------------------------------------|
| 1976 | UK               | Bus & Rail | -0.30 ± 0.2    | BLY PH                                                    |
|      | USA              |            | -0.41 ± 0.05   |                                                           |
|      | West Germany     |            | -0.34 ± 0.04   |                                                           |
|      | France, N, I, NZ |            | -0.32 ± 0.01   | France, Netherland, Italy, New Zealand                    |
| 1979 | USA              | Bus & Rail | -0.4 to -0.5   | PUTCHER and ROTHENBERG                                    |
| 1980 | UK               | Bus & Rail | -0.13 to -1.81 | Survey in 1978 in "black book" WEBSTER                    |
| 1981 | UK               | Rail       | -0.75          | BR Intercity, NASH                                        |
| 1981 | UK               | Rail       | -0.5           | Season ticket                                             |
|      |                  |            | -0.65          | Cheap day                                                 |
|      |                  |            | -0.20          | Full fare                                                 |
| 1982 | UK               | Rail       | -0.3           | Commuting                                                 |
|      |                  |            | -0.7           | Business                                                  |
|      |                  |            | -1.4           | Optional                                                  |
| 1985 | UK               | Rail       | -0.49          | SHELDON and STEER by SP                                   |
|      |                  |            | -0.86          | methods (Intercity)                                       |
|      |                  |            |                | Non-London base <100 miles (Intercity BR flow of 1972-81) |
|      |                  |            |                | > 100 miles by FOWKES                                     |



# APPENDIX H-2 (CONTD.)

| Year | Place     | Mode | Elasticity                             | Researcher/Writer - Notes and Comments                                  |
|------|-----------|------|----------------------------------------|-------------------------------------------------------------------------|
| 1986 | Australia | Rail | -0.89                                  | Non-business travel, HENSHER et al                                      |
| 1986 | UK        | Rail | -0.64<br>-0.11 to 1.18<br>-0.6 to -0.8 | mean<br>Range<br>Most are in this range<br><i>work by</i><br>HENSHER    |
| 1987 | UK        | Rail | -0.69<br>-1.08<br>-0.3                 | Short-term<br>Long-term<br>Commuting<br>OWEN and PHILIP<br>BR Intercity |
| 1985 | UK        | Rail | -0.7                                   | Journey to work<br>MACKETT                                              |
| 1985 | UK        | Rail | -1.5<br>-1.2                           | Fares up<br>Fares down<br>KROES et al by SP methods on<br>BR            |

Note:

- (i) The range is between -0.13 to -1.81
- (ii) Most in the range of -0.3 to -0.8
- (iii) The highest frequency is -0.3

## APPENDIX I

### PROGRAM FOR SIMULATION

```

10  REM obtain the price and demand data
20  GOSUB 130
30  REM run for each of three elasticities
40  FOR I = 1 TO 3
50  PRINT:PRINT "please enter the elasticity";
60  INPUT "(without minus sign)"; E
70  E = -E
80  REM calculate and display results
90  GOSUB 220
100 NEXT
110 REM run program again for next service
120 RUN
130 REM input data
140 PRINT "entering zero exits"; PRINT
150 INPUT "please enter original train fare"; P1
160 IF P1 = 0 THEN STOP
170 PRINT
180 INPUT "please enter original demand"; Q1
190 PRINT
200 INPUT "please enter the increased train fare"; P2
210 RETURN
220 REM calculate effect on passengers and revenue
230 GOSUB 400
240 PRINT: PRINT "results"
250 PRINT: PRINT "the elasticity is"; E
260 PRINT: PRINT "Daily passengers,"; Q1
270 PRINT: PRINT "Present Fare $"; P1
280 PRINT: PRINT "increased fare"; P2
290 PRINT "effects on passengers traffic, new demand";
300 PRINT USING "@@@,@@@@@"; Q2
320 PRINT: PRINT "increase in revenue";
330 PRINT USING "$$@,@@@@@"; R
340 PRINT: PRINT "old revenue, new revenue, % increase"
350 PRINT USING "$$@,@@@,@@@"; RO, NR,
360 PRINT " ";
370 PRINT USING "@@.@"; P
380 RETURN
390 END
400 K = E * (P2 - P1) / (P1 + P2)
410 Q2 = Q1 * (1 + K) / (1 - K)
420 REM now calc revenue
430 RO = Q1 * P1
440 NR = Q2 * P2
450 R = NR - RO
460 P = (R/RO) * 100
470 RETURN

```



**APPENDIX J**  
**WEST COAST OF WEST MALAYSIA FARE AND JOURNEY TIME\* OF RAIL, ROAD AND AIR TRANSPORT BETWEEN**  
**MAJOR TOWNS IN 1987**

Basepoint: Kuala Lumpur

| Destination       | EXPRESS        |                   |                    |                    | ORDINARY       |                |                |                    |
|-------------------|----------------|-------------------|--------------------|--------------------|----------------|----------------|----------------|--------------------|
|                   | FARE           |                   |                    | Journey Time (Hrs) | FARE**         |                |                | Journey Time (Hrs) |
|                   | 1st Class (\$) | 2nd Class AC (\$) | 2nd Class NAC (\$) |                    | 1st Class (\$) | 2nd Class (\$) | 3rd Class (\$) |                    |
| <b>Northbound</b> |                |                   |                    |                    |                |                |                |                    |
| Ipoh              | 32.00          | 18.00             | 15.00              | 3                  | 25.50          | 11.50          | 7.10           | 3.5                |
| Taiping           | 43.00          | 23.00             | 20.00              | 4.5                | 36.50          | 16.50          | 10.10          | 6                  |
| Butterworth       | 54.00          | 28.00             | 25.00              | 6.5                | 47.40          | 21.40          | 13.20          | 8                  |
| Alor Star         | -              | -                 | -                  | -                  | 57.10          | 25.10          | 15.80          | 10                 |
| <b>Southbound</b> |                |                   |                    |                    |                |                |                |                    |
| Seremban          | 15.00          | 11.00             | 8.00               | 1.25               | 9.00           | 4.10           | 2.50           | 1.5                |
| Johore Bharu      | 51.00          | 27.00             | 24.00              | 6.5                | 45.00          | 20.30          | 12.50          | 8.5                |
| Singapore         | 55.00          | 28.00             | 25.00              | 7                  | 48.60          | 21.90          | 13.50          | 10                 |

\* Journey time is not included in the stopping time at terminals/stations. Normally train stops more often than other transports.

\*\* Those travelers who use sleeping accommodation/cabin facilities need to pay extra charges - as displayed on page xx.

AC = Air conditioned

NAC = non-airconditioned

APPENDIX J (CONTD.)

| Type of Transport/<br>Destination | EXPRESS BUS  |                       | TAXI         |                       | AEROPLANE    |                       |
|-----------------------------------|--------------|-----------------------|--------------|-----------------------|--------------|-----------------------|
|                                   | Fare<br>(\$) | Journey<br>Time (Hrs) | Fare<br>(\$) | Journey<br>Time (Hrs) | Fare<br>(\$) | Journey<br>Time (Min) |
| Ipoh                              | 8.50         | 4.5                   | 15.00        | 3                     | 58           | 35                    |
| Taiping                           | 12.00        | 5                     | 22.00        | 4                     | -            | -                     |
| Butterworth                       | 15.50        | 6                     | 32.00        | 5                     | -            | -                     |
| Alor Star                         | 19.50        | 6.5                   | 40.00        | 6                     | 97           | 50                    |
| Seremban                          | 2.40         | 1                     | 6.00         | .75                   | -            | -                     |
| Johore Bharu                      | 15.20        | 6.5                   | 30.00        | 5                     | 80           | 45                    |
| Singapore                         | 17.00        | 7                     | 35.00        | 6                     | 135          | 50                    |



## **APPENDIX K**

### **QUESTIONNAIRES FOR THE SURVEY IN MR'S FARE EXPERIMENT - FEBRUARY 1990**

#### **Introducing the Survey**

1. Enumerator to introduce himself/herself to the potential respondent.
2. Explanation on the reasons for the SURVEY:
  - (a) to collect the following information:
    - (i) some background information (socio-economics)
    - (ii) information about the public's travelling activities
    - (iii) opinions about MR's fares and services
    - (iv) ranking the combination of future fare, travelling time and comfort (through class and type of train) according to their best preference down to the least preference. An introduction of conjoint analysis (Stated Preference) exercise.
  - (b) the aim of this survey is to plan for a better service quality level at a reasonable fare, which the public are able and willing to pay.
3. All answers must be marked/written by the enumerator himself or herself and no question should be left unanswered.

Date:

Time:

Name of respondent: .....

Respondent's address: .....

.....

Respondent's code:

Type of Train:

1. ☐

Mail/Night Sleeper
2. ☐

Ordinary
3. ☐

Express
4. ☐

Others

Class:

1. ☐

First
2. ☐

Second
3. ☐

Third

SECTION 1

This section referes to the socio-economic background of respondent. Please tick inthe appropriate box (✓) or specify wherever necessary.

1. Your age on the last birthday

1. ☐

16-25 years old

2. ☐

46-50 years old

2. ☐

26-35 years old

4. ☐

more than 50 years old

3. ☐

36-45 years old

2. Sex

1. ☐

Male

2. ☐

Female

3. Number of household

1. ☐

1-3

3. ☐

7-9

2. ☐

4-6

4. ☐

more than 9



4. Employment

- 1. ☐ Studying
- 2. ☐ Working
- 3. ☐ Own employment

- 4. ☐ Housewife
- 5. ☐ Unemployed
- 6. ☐ Retired

5. Monthly income (after tax)

- 1. ☐ Less than \$200
- 2. ☐ \$201-\$500
- 3. ☐ \$501-\$750

- 4. ☐ \$751-\$1000
- 5. ☐ More than \$1000

6. Type of transport owned

- 1. ☐ No Transport
- 2. ☐ Car
- 3. ☐ Motorcycle

- 4. ☐ Van
- 5. ☐ Others, specify  
.....

SECTION 2

This section requires the respondent's opinion on MR services and fares. Answer the following questions by ticking (✓) the appropriate boxes, or specify wherever necessary.

7. If you can afford it, what type of transport will you use for this journey?

- 1. ☐ Bus
- 2. ☐ Train
- 3. ☐ Car

- 4. ☐ Taxi
- 5. ☐ Aeroplane
- 6. ☐ Others, specify  
.....

8. MR is planning to increase its fares probably next year by 10% to 15%. Will you still take a train at its new fare?

- 1. ☐ Yes, if only 10%
- 2. ☐ Yes, if 15%

- 3. ☐ No

9. (This question is for the second and third class respondents only).

If you are offered to pay a few percent extra from what you are paying now to move up to the better class as following:

For third class passengers:

- (a) 10% extra to go to 2nd class, ie. 10% on every \$1
- (b) 20% extra to go to 1st class, ie. 20% on every \$1

For the second class passengers:

- (a) 10% extra to go to 1st class, ie. 10% on every \$1

Will you accept this offer

- 1. ☐ Yes, to second class
- 2. ☐ Yes, to first class
- 3. ☐ No

10. In your opinion, how should MR alter their present passenger services?

- 1. ☐ Stop all the services totally
- 2. ☐ Stop the unprofitable services
- 3. ☐ Continue as it is
- 4. ☐ Improve its services
- 5. ☐ Continue upon the condition that MR improves services substantially, (probably followed by fare increases)

### SECTION 3

This section requires the respondent to arrange 12 cards where everyone of them contains the combination of fare, type of train, class, and travelling time. The cards have to be arranged according to the most preferred to the least preferred.

#### Instruction to the enumerator:

After the respondent has arranged the card, write down the number 1-12 in the boxes according to what has been chosen, ie. the very top card as number one and the last card as number 12.

Every card was given letter A to L as their code.

#### CLASS 1

|   |                          |             |         |         |                 |                 |
|---|--------------------------|-------------|---------|---------|-----------------|-----------------|
| A | <input type="checkbox"/> | NS, AC, SA  | \$68.60 | \$72.50 | 9 hrs           | 8 hrs           |
| B | <input type="checkbox"/> | NS, NAC, SA | \$58.60 | \$62.50 | 9               | 8               |
| C | <input type="checkbox"/> | ER          | \$55.00 | \$60.50 | 7 $\frac{1}{2}$ | 6 $\frac{1}{2}$ |
| D | <input type="checkbox"/> | EXP, AC     | \$55.00 | \$60.50 | 7               | 6               |



## CLASS 2

|   |                          |                   |         |         |                |                |
|---|--------------------------|-------------------|---------|---------|----------------|----------------|
| E | <input type="checkbox"/> | NS/M, NAC, SA (L) | \$29.90 | \$32.10 | 9 hrs          | 8 hrs          |
| F | <input type="checkbox"/> | NS/M, AC, SA (U)  | \$27.90 | \$30.10 | 9              | 8              |
| G | <input type="checkbox"/> | ER                | \$28.00 | \$30.80 | $7\frac{1}{2}$ | $6\frac{1}{2}$ |
| H | <input type="checkbox"/> | EXP, AC           | \$21.90 | \$30.80 | 7              | 6              |
| I | <input type="checkbox"/> | B, NAC            | \$15.00 | \$23.00 | $9\frac{3}{4}$ | $8\frac{3}{4}$ |

## CLASS 3

|   |                          |    |         |         |                    |                    |
|---|--------------------------|----|---------|---------|--------------------|--------------------|
| J | <input type="checkbox"/> | M  | \$13.50 | \$14.20 | $9\frac{1}{2}$ hrs | $8\frac{1}{2}$ hrs |
| K | <input type="checkbox"/> | ER | \$17.00 | \$17.85 | $7\frac{1}{2}$     | $6\frac{1}{2}$     |
| L | <input type="checkbox"/> | B  | \$13.50 | \$13.50 | $9\frac{3}{4}$     | $8\frac{3}{4}$     |

## INDICATION

|     |   |                        |
|-----|---|------------------------|
| NS  | - | Night sleeper          |
| NAC | - | Non-airconditioned     |
| AN  | - | Airconditioned         |
| SA  | - | Sleeping Accommodation |
| ER  | - | Rakyat Express         |
| EXP | - | Sinaran Express        |
| M   | - | Mail Train             |
| B   | - | Ordinary Train         |
| L   | - | Lowerbed               |
| U   | - | Upperbed               |
| PF  | - | Present Fare           |
| FF  | - | Future Fare            |
| PTT | - | Present Travel Time    |
| FTT | - | Future Travel Time     |

## APPENDIX K-1

### SOALSELIDIK BAGI KAJIAN UNTUK EKSPERIMEN BAGI KENAIKAN TAMBANG KTM - FEBRUARI 1990

#### Pengenalan

-----

1. Enumerator memperkenalkan diri kepada responden.
2. Penerangan mengenai sebab-sebab KAJISELIDIK:
  - (a) Untuk mengumpulkan
    - (i) Beberapa maklumat latar belakang penumpang.
    - (ii) Maklumat mengenai aktiviti-aktiviti perjalanan penumpang.
    - (iii) Maklumat mengenai pendapat umum tentang tambang dan mutu perkhidmatan keretapi.
    - (iv) Maklumat mengenai pilihan kombinasi tambang, masa perjalanan dan keselesaan (di segi kelas dan jenis perkhidmatan) yang responden paling gemari/setuju.
3. Semua jawapan mestilah ditandakan/ditulis oleh enumerator sendiri dan tidak ada soalan yang ditinggalkan tidak berjawab.



Tarikh:.....

Masa:.....

Nama Responden :.....

Alamat Responden:.....

.....

.....

Kod Responden :.....

.....

Jenis Keretapi:

1 | ☐ | Mel/Senandung Malam

2 | ☐ | Biasa

3 | ☐ | Ekspres

4 | ☐ | Lain-lain

Kelas:

1 | ☐ | Satu

2 | ☐ | Dua

3 | ☐ | Tiga

BAHAGIAN 1

-----

Bahagian ini adalah untuk maklumat latar belakang responden. Jawab soalan-soalan dengan menandakan (/) dalam kotak-kotak berkenaan, atau jelaskan di mana perlu.

1. Umur anda pada tarikh lahir yang lepas

- 1   ☐   16 - 25 tahun  
2   ☐   26 - 35 tahun  
3   ☐   46 - 50 tahun  
4   ☐   51 tahun ke atas

2. Jantina

- 1   ☐   Lelaki                      2   ☐   Perempuan

3. Bilangan isi rumah

- 1   ☐   1 - 3  
2   ☐   4 - 6  
3   ☐   7 - 9  
4   ☐   Lebih dari 9

4. Pekerjaan

- |                                            |                                       |
|--------------------------------------------|---------------------------------------|
| 1 <input type="checkbox"/> Belajar         | 4 <input type="checkbox"/> Suri rumah |
| 2 <input type="checkbox"/> Bekerja         | 5 <input type="checkbox"/> Menganggur |
| 3 <input type="checkbox"/> Bekerja sendiri | 6 <input type="checkbox"/> Pencen     |



5. Pendapatan bulanan selepas cukai

- |   |                      |                   |   |                      |                   |
|---|----------------------|-------------------|---|----------------------|-------------------|
| 1 | <input type="text"/> | Kurang dari \$200 | 4 | <input type="text"/> | \$751 - \$1000    |
| 2 | <input type="text"/> | \$201 - \$500     | 5 | <input type="text"/> | Lebih dari \$1000 |
| 3 | <input type="text"/> | \$501 - \$750     |   |                      |                   |

6. Jenis kenderaan yang dimiliki

- |   |                      |           |   |                      |                         |
|---|----------------------|-----------|---|----------------------|-------------------------|
| 1 | <input type="text"/> | Tiada     | 4 | <input type="text"/> | Van                     |
| 2 | <input type="text"/> | Kereta    | 5 | <input type="text"/> | Lain-lain,<br>Nyatakan: |
| 3 | <input type="text"/> | Motosikal |   |                      | <hr/>                   |

## BAHAGIAN II

Bahagian ini memerlukan pendapat penumpang mengenai perkhidmatan dan tambang KTM. Jawab soalan-soalan dengan menandakan (/) dalam kotak-kotak berkenaan, atau jelaskan di mana perlu.

7. Jika anda mampu, apakah jenis pengangkutan yang akan anda pilih bagi perjalanan ini?

- |   |                          |          |   |                          |                         |
|---|--------------------------|----------|---|--------------------------|-------------------------|
| 1 | <input type="checkbox"/> | Bas      | 4 | <input type="checkbox"/> | Teksi                   |
| 2 | <input type="checkbox"/> | Keretapi | 5 | <input type="checkbox"/> | Kapal terbang           |
| 3 | <input type="checkbox"/> | Kereta   | 6 | <input type="checkbox"/> | Lain-lain,<br>Nyatakan: |
- 

8. Jika KTM ingin menaikkan tambang mereka dalam 6 bulan yang akan datang dengan kadar 10% hingga 15%, adakah anda masih bercadang untuk menaiki keretapi

- |   |                          |                    |
|---|--------------------------|--------------------|
| 1 | <input type="checkbox"/> | Ya, jika hanya 10% |
| 2 | <input type="checkbox"/> | Ya, jika 15%       |
| 3 | <input type="checkbox"/> | Tidak              |

9. (Soalan ini ditujukan kepada penumpang Kelas 2 dan 3 sahaja) Jika anda ditawarkan untuk membayar beberapa peratus lebih dari yang anda bayar sekarang untuk berpindah ke kelas yang lebih baik seperti berikut:

Bagi penumpang Kelas 3:

- (a) 10% tambahan untuk ke kelas 2, 10 sen bagi tiap-tiap \$1  
(b) 20% tambahan untuk ke kelas 1, 20 sen bagi tiap-tiap \$1

Bagi penumpang Kelas 2:

- |   |                          |                           |
|---|--------------------------|---------------------------|
| 1 | <input type="checkbox"/> | Ya, jika untuk ke kelas 2 |
| 2 | <input type="checkbox"/> | Ya, jika untuk ke kelas 1 |



10. Pada pendapat anda, apakah yang KTM patut lakukan kepada perkhidmatan penumpang mereka sekarang?

- 1 ☐ Berhentikan semua perkhidmatan
- 2 ☐ Berhentikan perkhidmatan yang merugikan
- 3 ☐ Teruskan seperti apa yang ada
- 4 ☐ Baiki lagi taraf perkhidmatan
- 5 ☐ Teruskan dengan syarat memperbaiki kualiti perkhidmatan secara besar-besaran yang berkemungkinan akan diikuti oleh kenaikan tambang.

### BAHAGIAN III

Bahagian ini memerlukan responden memilih satu kad dari 12 kad-kad yang mana tiap-tiap satunya mengandungi kombinasi harga, jenis perkhidmatan, kelas dan masa perjalanan yang responden paling gemari (preferred).

Arahan kepada enumerator:

Selepas responden membuat pilihan, catitkan nombor kad yang dipilih itu dalam lembaran soalselidik ini dengan menandakan (/) pada kotak yang berkenaan.

|      |   |                             |
|------|---|-----------------------------|
| SM   | = | Senandung Malam             |
| TBD  | = | Tidak Berhawa Dingin        |
| BD   | = | Berhawa Dingin              |
| TT   | = | Tempat Tidur                |
| ER   | = | Ekspres Rakyat              |
| ES   | = | Ekspres Sinaran             |
| KM   | = | Keretapi Mel                |
| KB   | = | Keretapi Biasa              |
| B    | = | Katil Bawah                 |
| A    | = | Katil Atas                  |
| TS   | = | Tambang Semasa              |
| TAD  | = | Tambang Akan Datang         |
| MPS  | = | Masa Perjalanan Semasa      |
| MPAD | = | Masa Perjalanan Akan Datang |

#### Kelas 1

|   |                          |           | TS      | TAD     | MPS       | MPAD      |
|---|--------------------------|-----------|---------|---------|-----------|-----------|
| A | <input type="checkbox"/> | SM,TBD,TT | \$68.60 | \$72.50 | 9 hrs     | 8 hrs     |
| B | <input type="checkbox"/> | SM,BD,TT  | \$58.60 | \$62.50 | 9 hrs     | 8 hrs     |
| C | <input type="checkbox"/> | ER        | \$55.00 | \$60.50 | 7 1/2 hrs | 6 1/2 hrs |
| D | <input type="checkbox"/> | ES,BD     | \$55.00 | \$60.50 | 7 hrs     | 6 hrs     |



## Kelas 2

-----

|   |                          |              |         |         |           |           |
|---|--------------------------|--------------|---------|---------|-----------|-----------|
| E | <input type="checkbox"/> | SM/KM,BD (B) | \$29.90 | \$32.10 | 9 hrs     | 8 hrs     |
| F | <input type="checkbox"/> | SM/KM,BD (A) | \$27.90 | \$30.10 | 9 hrs     | 8 hrs     |
| G | <input type="checkbox"/> | ER           | \$28.00 | \$30.80 | 7 1/2 hrs | 6 1/2 hrs |
| H | <input type="checkbox"/> | ES,BD        | \$21.90 | \$30.80 | 7 hrs     | 6 hrs     |
| I | <input type="checkbox"/> | KB,TBD       | \$55.00 | \$23.00 | 9 3/4 hrs | 8 3/4 hrs |

## Kelas 3

-----

|   |                          |    |         |         |           |           |
|---|--------------------------|----|---------|---------|-----------|-----------|
| J | <input type="checkbox"/> | KM | \$13.50 | \$14.20 | 9 1/2 hrs | 8 1/2 hrs |
| K | <input type="checkbox"/> | ER | \$17.00 | \$17.85 | 7 1/2 hrs | 6 1/2 hrs |
| L | <input type="checkbox"/> | KB | \$13.50 | \$13.90 | 7 3/4 hrs | 8 3/4 hrs |

## **APPENDIX L**

### **QUESTIONNAIRES FOR MALAYAN RAILWAY FARE EXPERIMENT STUDY USING 'STATED PREFERENCE' APPROACH, MARCH 1990**

This questionnaire is for an experiment to find out the utility level of railway passengers on fare, travelling time and comfort by applying the 'stated preference method' analysis. It's objective is to see how the respondents value or place the importance of three train attributes, as mentioned earlier. Comfort here means airconditioned coaches, guaranteed seat, cleanliness, cafeteria facilities on train and spacious. Respondent's choices will be analysed by a computer program Trade-off Procedural Text Analysis (TOFPTA) in order to reveal their utility level.



## SECTION A

Background information and train travel  
activity of the respondents.

Respondent's Code:      Time:

Date:

Name:

Student Number:

Permanent Address:

Year of study in session 1989/90: 1,2,3,4

Department and Faculty:

## QUESTIONS

Please tick (✓) the chosen answer

1. ~~Age last~~<sup>Age last</sup> birthday

1. ☐ 20 – 25 years old  
2. ☐ 25 – 30 years old

3. ☐ > 30 years old

2. Sex

1. ☐ Male

2. ☐ Female

3. Transport owned

1. ☐ No transport  
2. ☐ Motor cycle

3. ☐ Car  
4. ☐ Others, specify  
.....

4. When did you last travel by express train?

1. ☐ 1 week ago  
2. ☐ 1 month ago  
3. ☐ 2 months ago

4. ☐ 3 months ago  
5. ☐ More than 3 months ago

5. What class of ticket did you purchase for the above question 4?

1. ☐ Class 1

2. ☐ Class 2

3. ☐ Class 3

6. How frequent do you travel by train?

1. ☐ 1-2 times a year

3. ☐ 5-6 times a year

5. ☐ More than 8 times a year

2. ☐ 3-4 times a year

4. ☐ 7-8 times a year

7. Do you plan to travel by train within one month?

1. ☐ Yes

2. ☐ No

## SECTION B

Exercise for 'stated preference' approach using  
trade-off method

Journey:

Kuala Lumpur - Butterworth  
Kuala Lumpur - Singapore

Type of train:

Express Sinaran

Class of train:

Second

Present fare:

\$28.00

Current travelling time:

$7\frac{1}{2}$  hour

Current level of comfort:

0

Train attribute involved:

Fares, travelling time and comfort

Symbol:

Fares - F, Travelling Time - TT, Comfort - C

Level:

Worst - W, Average - A, Best - B

### Instruction

Let us begin by assessing the degree of importance you place upon each attribute in making the decision to travel by train. As a first step, let's try to order the SC's (the Scaling Constant).



### Question

1. Take attribute Fares (F) and travelling time (TT). Consider an option \$28.00 F and  $7\frac{1}{2}$  hours TT. Both are at their worst levels because F is expensive and TT is long.

(a) Would you rather move down to ~~\$~~26.00 (A) or 6 hours TT (A).

Respondent 1. F 2. TT

(b) If F reduced to \$25.00 (B) or TT = 5 hours (B), which would you choose?

Respondent 1. F 2. TT

(c) How about F = \$26.00 (A), or TT = 5 hours (B): which is more interesting?

Respondent 1. F 2. TT

(d) Consider this combination and choose the best. F = \$25.00 (B) or TT = 6 hours (A)

Respondent 1. F 2. TT

### Instruction

Now we would like to establish your preference between Fare (F) and Comfort (C).

### QUESTION

2. Will you consider Fare = \$28.00 (W) or Comfort = 0 (W). Both are at the worst level because F is expensive and C is uncomfortable.

(a) Which one will you like to exchange? Fare reduces to \$26.00 (A), Comfort is improved to Level (A).

Respondent 1. F 2. C

(b) When fare reduces to \$26.00 (A), Comfort is improved to the best level C = 2 (B): which one do you prefer?

Respondent 1. F 2. C

(c) Between Fare = \$25.00 (B), and Comfort at level 1 (A), which is more interesting?

Respondent 1. F 2. C

(d) In this part you are required to choose between these two combinations: either Fare = \$25.00 (B) or Comfort level = 2 (B)

Respondent 1. F 2. C

### Instruction

Now we are trying to investigate the relationship between travelling time (TT) and comfort (C).

3. Will you prefer  $TT = 7\frac{1}{2}$  hours (W), or  $C = 0$  (W) where both are at the very Worst (W) level because TT - long, C - uncomfortable.

(a) Which would you like to exchange? TT reduces to 6 hours (A), or C moves up to level 1 (A).

Respondent 1. TT 2. C

(b) If TT at 6 hours (A), but C moves up further to the best level = 2 (B), which one do you like better?

Respondent 1. TT 2. C

(c) Here we reduced the Travelling Time to 5 hours (B) and Comfort is at level 1 (A). Which one do you prefer?

Respondent 1. TT 2. C

(d) Now assume that Travelling Time and Comfort are at their best level,  $TT = 5$  hours (B) and  $C = 2$  (B). Will you choose TT or C?

Respondent 1. TT 2. C

#### Instruction

4. Please state the value for Fares, Travelling Time and Comfort which you think is equivalent to the best level (B) of each attribute.

- |     |                             |                                                                                          |
|-----|-----------------------------|------------------------------------------------------------------------------------------|
| (a) | Fare \$25.00 (B)            | Travelling time is between 5 hours to $7\frac{1}{2}$ hours.<br>..... hours ..... minutes |
| (b) | Fare \$25.00 (B)            | Comfort level is 1, 2, 3, 4, 5 (the bigger the number the higher the comfort).....       |
| (c) | Travelling time 5 hours (B) | Fare is between \$25.00 to \$28.00<br>\$.....                                            |
| (d) | Travelling time 5 hours (B) | Comfort is 1, 2, 3, 4, 5 .....                                                           |
| (e) | Comfort is at 5 (B)         | Travelling time is between 5 hours to $7\frac{1}{2}$ hours<br>..... hours ..... minutes  |
| (f) | Comfort is at 5 (B)         | Fare is between \$25.00 to \$28.00<br>\$.....                                            |



## APPENDIX L-1

### SOALSELIDIK UNTUK KAJIAN EKSPERIMEN TAMBANG PERKHIDMATAN KTM DENGAN MENGGUNAKAN PENDEKATAN 'STATED PREFERENCE', MARCH 1990

Soalselidik ini adalah sebagai eksperimen yang bertujuan untuk melihat tingkat utiliti penumpang-penumpang keretapi ke atas tambang, masa perjalanan dan keselesaan dengan menggunakan analisa 'Stated Preference Method'. Objektif utama ialah untuk melihat bagaimana responden menilai kepentingan ketiga-tiga attribut tadi. Keselesaan bermakna koc-koc berhawa dingin, tempat duduk yang pasti, kebersihan, kemudahan kafeteria dan ruang di dalam keretapi. Pilihan reponden akan dianalisa dengan menggunakan satu program komputer yang dipanggil 'Trade-off Procedural Text Analysis (TOFPTA)' untuk melihat atau mengukur tingkat utiliti penumpang-penumpang.

#### BAHAGIAN A

Maklumat latarbelakang dan aktiviti  
perjalanan dengan keretapi  
responden.

Kod Responden:.....

Tarikh:.....

Masa:.....

Nama Responden : .....

Alamat Responden:.....  
(Tetap)

.....

.....

Nombor Pendaftaran: .....

Tahun Pengajian dalam Sesi 1989/90: 1, 2, 3, 4.

Fakulti dan Jabatan: .....

### SOALAN-SOALAN

Sila tandakan (/) pada jawapan yang dipilih

1. Umur pada tarikh lahir yang lepas

1 ☐ 20 - 25 tahun

2 ☐ 25 - 30 tahun

3 ☐ > 30 tahun

2. Jantina

1 ☐ Lelaki

2 ☐ Perempuan

3. Kenderaan yang dimiliki

1 ☐ Tiada kenderaan

3 ☐ Motokar

2 ☐ Motosikal

4 ☐ Lain-lain,  
nyatakan  
.....

4. Bilakah kali terakhir anda menaiki keretapi Ekspres?

1 ☐ 1 minggu yang lepas

4 ☐ 3 bulan yang lepas

2 ☐ 1 bulan yang lepas

5 ☐ Lebih dari tiga  
bulan yang lepas

3 ☐ 2 bulan yang lepas

5. Tiket kelas berapakah anda beli untuk soalan (4) di atas?

1 ☐ Kelas 1

2 ☐ Kelas 2

3 ☐ Kelas 3



6. berapakah kerapkah anda menaiki keretapi?

- |   |                      |                    |   |                      |                           |
|---|----------------------|--------------------|---|----------------------|---------------------------|
| 1 | <input type="text"/> | 1 - 2 kali setahun | 4 | <input type="text"/> | 7 - 8 kali setahun        |
| 2 | <input type="text"/> | 3 - 4 kali setahun | 5 | <input type="text"/> | Lebih dari 8 kali setahun |
| 3 | <input type="text"/> | 5 - 6 kali setahun |   |                      |                           |

7. Adakah anda bercadang untuk menaiki keretapi dalam masa satu bulan akan datang?

- |   |                      |    |   |                      |       |
|---|----------------------|----|---|----------------------|-------|
| 1 | <input type="text"/> | Ya | 2 | <input type="text"/> | Tidak |
|---|----------------------|----|---|----------------------|-------|

**BAHAGIAN B**

Eksesais bagi pendekatan 'Stated  
'preference' menggunakan kaedah  
'trade-off'.

Perjalanan : Kuala Lumpur - Butterworth  
Kuala Lumpur - Singapura

Jenis keretapi : Sinaran Ekspres

Kelas : Dua

Tambang Sekarang : \$28.00

Masa Perjalanan Sekarang : 7 1/2 jam

Tingkat Keselesaian Sekarang: 0

Attribut Keretapi : Tambang, masa perjalanan dan keselesaian

Simbol : Tambang - T, Masa Perjalanan - MP,  
Keselesaian - K.

Tingkat : Paling tidak baik - TB, Sederhana - S,  
Terbaik - B. .

## Arahan

Sekarang kita mula menilai peringkat kepentingan yang anda akan berikan kepada tiap-tiap atribut untuk membuat keputusan menaiki keretapi. Langkah pertama ialah kita cuba mengatur SC's (the Scaling Constant - Kemalaran Persekalaan).

## SOALAN

1. Ambil atribut Tambang (T) dan Masa Perjalanan (MP). Pertimbangan pilihan \$28.00 T dan 7 1/2 jam MP. Kedua-duanya adalah pada tingkat paling tidak baik kerana T adalah mahal dan MP adalah lama.

- (a) Adakah anda akan turun kepada \$26.00 (S) atau 6 jam MP (S).

Responden            1.    T                    2.    MP

- (b) Jika T dikurangkan kepada \$25.00 (B) atau MP = 5 jam (B), yang manakah akan anda pilih?

Responden            1.    T                    2.    MP

- (c) Bagaimana pula dengan T = \$26.00 (S), atau MP = 5 jam (B), yang manakah lebih menarik?

Responden            1.    T                    2.    MP

- (d) Pertimbangkan kombinasi ini dan pilih yang terbaik. T = \$25.00 (B) atau MP = 6 jam (S).

Responden            1.    T                    2.    MP



## Arahan

Sekarang kita ingin melihat keutamaan yang anda letak di antara Tambang (T) dan Keselesaan (K).

## SOALAN

2. Yang mana satu lebih penting, Tambang - \$28.00 (TB) atau Keselesaan = 0 (TB). Kedua-duanya adalah pada tingkat yang paling tidak baik kerana T adalah mahal dan K adalah tidak selesa.

(a) Yang mana satukah yang anda ingin pertukarkan? Tambang diturunkan kepada \$26.00 (S), keselesaan diperbaiki ke tingkat (S).

Responden            1.    T                      2.    K

(b) Bila tambang diturunkan kepada \$26.00 (S), keselesaan diperbaiki kepada tingkat terbaik K = 2 (B): Yang manakah yang anda lebih suka?

Responden            1.    T                      2.    K

(c) Di antara Tambang = \$25.00 (B) dan keselesaan pada tingkat 1 (S), yang mana lebih menarik?

Responden            1.    T                      2.    K

(d) Di dalam bahagian ini anda dikehendaki untuk memilih di antara dua kombinasi berikut: sama ada Tambang = \$25.00 (B) atau tingkat keselesaan = 2 (B)

Responden            1.    T                      2.    K

## Arahan

Sekarang kita akan cuba mengkaji perhubungan di antara Masa Perjalanan (MP) dan Keselesaan (K)

3. Adakah anda lebih memilih MP = 7 1/2 jam (TB) atau K = 0 (TB) di mana kedua-duanya berada pada tingkat paling tidak baik (TB) kerana MP - panjang dan K - tidak selesa.

- (a) Yang manakah anda sanggup pertukarkan? MP diturunkan ke 6 jam (S) atau K berubah ke tingkat 1 (S)

Responden            1.    MP                    2.    K

- (b) Jika MP adalah 6 jam (S), tetapi K bertambah baik ke peringkat = 2 (B), yang manakah yang paling anda suka?

Responden            1.    MP                    2.    K

- (c) Di sini kita kurangkan Masa Perjalanan kepada 5 jam (B) dan keselesaan pada tingkat 1 (S). Yang manakah yang anda lebih suka?

Responden            1.    MP                    2.    K

- (d) Sekarang andaikan Masa Perjalanan dan Keselesaan adalah pada peringkat terbaik, MP = 5 jam (B) dan K = 2 (B). Adakah anda memilih MP atau K?

Responden            1.    MP                    2.    K



## Arahan

4. Sila nyatakan nilai bagi Tambang, Masa Perjalanan dan Keselesaan yang anda rasa adalah bersamaan dengan tingkat terbaik (B) bagi tiap-tiap attribut.

- |                                  |                                                                                              |
|----------------------------------|----------------------------------------------------------------------------------------------|
| (a) Tambang \$25.00 (B)          | Masa perjalanan di antara 5 jam hingga 7 1/2 jam ..... jam ..... minit                       |
| (b) Tambang \$25.00 (B)          | Tingkat keselesaan adalah 1,2,3,4,5 (nombor yang lebih besar menunjukkan lebih selesa) ..... |
| (c) Masa Perjalanan 5 jam (B)    | Tambang di antara \$25.00 dan \$28.00. \$ .....                                              |
| (d) Masa Perjalanan 5 jam (B)    | Keselesaan adalah 1,2,3, 4,5 .....                                                           |
| (e) Keselesaan adalah pada 5 (B) | Masa perjalanan di antara 5 jam hingga 7 1/2 jam ..... jam ..... minit                       |
| (f) Keselesaan ialah pada 5 (B)  | Tambang ialah di antara \$25.00 dan \$28.00. \$ .....                                        |













