

# **CURRENT PUBLIC TRANSPORT RECORD: ETHEKWINI'S EXPERIENCE**

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## **ABSTRACT**

This paper gives an overview of the processes and procedures that the eThekwini Municipality adopted for its Current Public Transport Record (CPTR) in terms of the National Land Transport Transition Act 2000, including a Public Transport Management Information System (PTMIS) that has been developed by the eThekwini Transport Authority (eTA) to capture and manage the data collected by the CPTR process. Issues such as the project structure, difficulties encountered and the current modus operandi of the bus and mini-bus taxi industry are highlighted.

The detailed statistics of all data collected are presented including the total number of operators / associations in the eThekwini Municipal area, the number of current routes, number of facilities and the number of trips, all by mode and period. A summary comparison with other major cities in South Africa is also given.

The detailed costs of collecting the data are presented including system development costs, survey costs and consultant's costs. The total costs are converted to a project unit cost per vehicle trip, a cost per record, a cost per facility and a cost per association / operator. These costs are compared to the survey costs in other industries like consumer marketing and an analysis is undertaken of the cost effectiveness of the data collection process by survey type.

The involvement and use of the taxi industry and BEE companies including PDI staff of non-BEE companies throughout the entire project process are presented. The eTA has been very successful in empowerment and capacity building through the CPTR process.

## **1. INTRODUCTION**

In 1998 the eThekwini Municipality produced its first Current Public Transport Record, although this was not a comprehensive study or data collection exercise. The Fundamental Restructuring of eThekwini's Public Transport System undertaken in 2000 also collected public transport data that concentrated on origin-destination patterns for all modes. This data was used for detailed public transport modelling but was not collected nor captured in the formats required for a CPTR as is currently required.

In accordance with the Planning Requirements of Part 7 of the National Land Transport Transition Act, 2000, the eThekwini Municipality was required to update its existing public transport data such that it was comprehensive enough and in the format required by the national legislation for a CPTR. A phased approach was adopted for the CPTR process,

from a pre-study investigation to submission of the completed database, which took approximately two years, commencing in August 2002.

## **2. PROCEDURES AND METHODOLOGY**

### 2.1 Phases and time frames

#### *2.1.1 Phase 1: Investigation into the CPTR and OLS data requirements*

The first phase of the project was a pre-study to investigate in detail the data requirements to satisfy the criteria for a CPTR and Operating Licence Strategy (OLS) in terms of the national legislation. The investigation commenced in August 2002 and lasted for a period of 6 months. The investigation was essentially a desktop study and included discussions with counterparts from Cape Town and Tshwane to establish the information collected by these two municipalities, the survey methods used and how the data was analysed and stored for their respective CPTR's. Discussions were also held with the permit board.

#### *2.1.2 Phase 2: Pilot study*

The CPTR pilot study commenced in February 2003 after the pre-study investigation work was completed and lasted for a period of 6 months, ending in June 2003. The objective of the pilot study was firstly to create and refine all of the survey forms required to collect the data and then test the recommended methodology for undertaking the surveys that was established during the Phase 1 initial investigation of the project.

The eThekweni Municipal area was divided into 8 heterogeneous areas and one of these areas that included large residential zones, a large employment zone and contained a major passenger interchange / transfer facility within the municipal area was chosen for the pilot study. This choice was based on the premise that due to its urban diversity and interchange function, most problems associated with the collection and validation of the survey data would be encountered in this area. Once the full CPTR project was under way, it transpired that each heterogeneous area DITTO was almost unique with different types of data collection challenges.

Seventeen forms were originally developed to collect the data required for the CPTR and most of these forms were refined and some aborted during the pilot project phase in response to the modus operandi of the bus and minibus taxi services in the pilot project area.

#### *2.1.3 Phase 3: Full project*

The full project that entailed the surveying of the remaining seven areas on an area by area and mode by mode basis, the validation of all forms, the capture of the validated forms and the validation of the captured data commenced on August 2003 and the project lasted for a period of 16 months ending in November 2004.

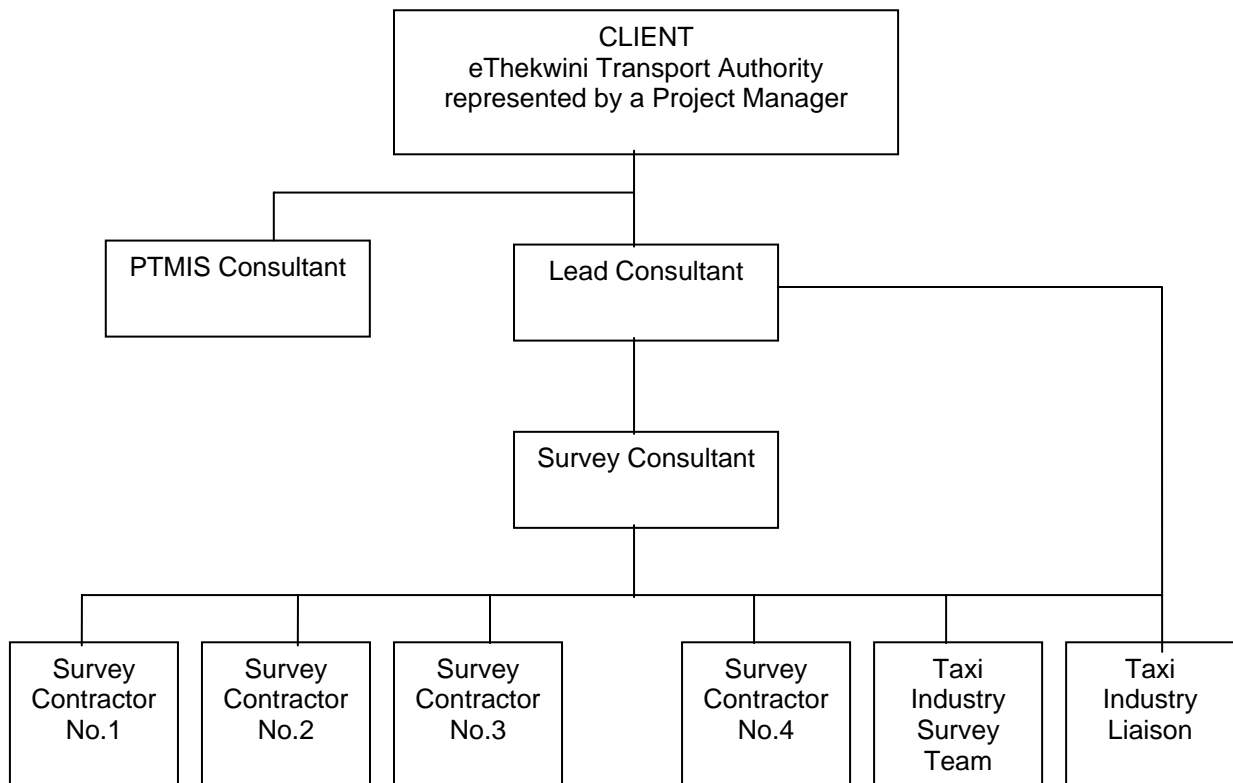
## 2.2 Project structure for each phase

### *2.2.1 Investigation into the CPTR and OLS data requirements*

A consulting engineering firm who reported to a Project Manager from the eThekweni Transport Authority undertook this phase of the process.

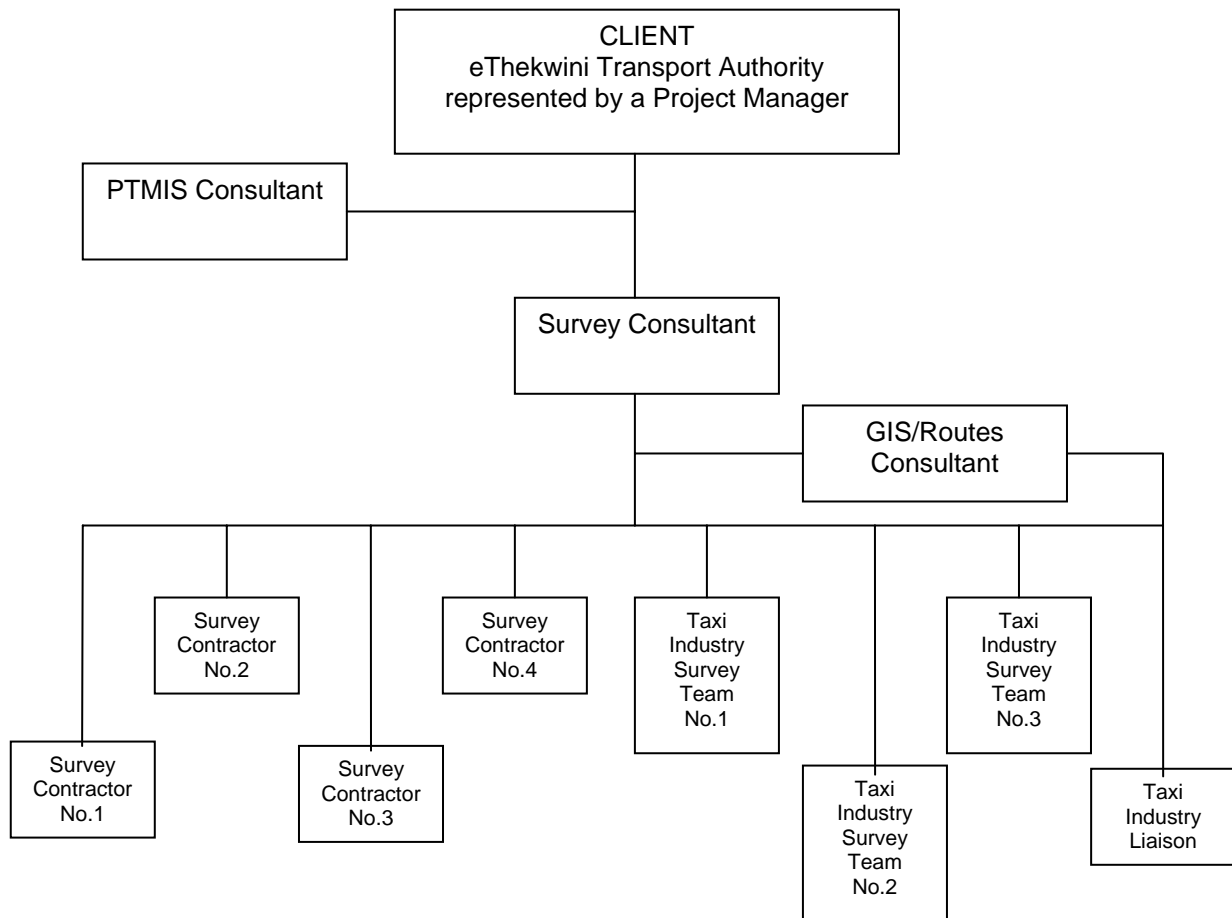
### *2.2.2 Pilot study*

The project structure for the Pilot Study Phase was as follows:



### 2.2.3 Full project

The project structure for this final phase was as follows:



A total of 85 personnel from the consultants, survey contractors and the taxi industry worked on the full project over the two and a half year period of which 94% are PDI's and 40% came directly from the taxi industry.

### 2.3 Data collection

Of the 17 forms originally developed, a total of 15 survey forms were finalised to collect the data required for the CPTR and are listed in Annexure A. Every survey form contained the following base information: date, time period, location, contractor and enumerator.

Before each area was surveyed, the scheduled bus services that operate from that area were obtained from all the registered bus operators and the contact details of all the taxi associations that operate from that area were obtained. Bus trips were surveyed first followed by minibus taxi trips. The main reason for this is that the taxi surveys required extensive pre-survey liaison and modus operandi evaluation to establish the extent and type of minibus taxi services provided in the area so that the correct surveys could be conducted.

Residential zones were surveyed during the AM peak 3 hour period from 05h00 to 08h00 and the employment zones were surveyed during the PM peak period from 15h30 to 18h30. Interchange locations and ranks that are a major origin and destination point were surveyed during both these peak periods.

Only external trips were surveyed, trips internal to the heterogeneous area and feeder trips were not surveyed due to budget and time constraints. Unroadworthy vehicles very often provide these internal and feeder service trips.

The survey consultant conducted audit surveys as often as practically possible during the survey period in an attempt to ensure some accuracy and consistency amongst the survey contractors.

Train trips were surveyed separately by Metro Rail / SARCC on a similar basis to the bus surveys.

## 2.4 Survey form validation

After each area was surveyed by mode, a debriefing session was held individually with each survey contractor. At this debriefing the survey contractor advised of any problems that were encountered during the survey (there were often numerous with the taxi surveys) and for the taxi industry described in detail the modus operandi of the various taxi services by each taxi association. From this, the GIS / Routing consultant was able to finalise the bus route network and develop a taxi route network for that particular area.

During the de-briefing session where surveys were found to be inadequate due to understaffing or incorrect survey forms or the survey was aborted due to inclement weather or lack of co-operation from the taxi drivers, a decision was made what course of action was necessary. Fortunately did this not occur often.

The number of survey forms received from each contractor by type and mode were checked, numbered, logged and filed into a pre-capture filing system. The form validation included checks for completeness, legibility and logic.

## 2.5 Data capture

A team of four data capturers with a supervisor captured the forms at four separate workstations. Once the data was captured, a further 5 rounds of validation and cross validation were undertaken in order to improve the accuracy and confidence of the data. One of these validations included exporting the data into a spreadsheet format and undertaking duplicate and matching checks by dates, time and numberplates. Even after this extensive validation, problems with the data were still encountered due to a combination of factors including the PTMIS validation systems and data incorrectly allocated.

## 2.6 Reporting

Once the data was captured and validated in the system, the PTMIS program produced reports in the format required by the national legislation. These reports were reviewed and validated to ensure that the correct information was presented in them and to ensure that the information looked logical.

Again, even after all of the above validations, PTMIS's interpretation and presentation of the data whilst in the required format, could not really be used for other planning projects or for reference purposes due to the limitations of the report tables. All of the reports were for the peak hour for that particular facility or origin / destination whereas the planning and operational analysis usually required a full analysis of the 3 hour survey period.

### **3. PROJECT REVIEW**

#### 3.1 Modus operandi of the transport service providers in eThekweni

##### *3.1.1 Minibus taxi services*

The minibus taxi industry in eThekweni is essentially informal in structure and operationally unregulated. The minibus taxi services are income driven and hence operate solely on a demand basis.

As such, there is very little consistency in the methods of service provision from area to area and from rank to rank. Methods of operation change from time period to time period even within the peaks and then change again to another system during off-peak periods. At any given location the method of operation can also change from day to day and from week to week depending on circumstances including weather and time of month. Instances of split fleets, alternative drivers for the same vehicle and the transfer of vehicles between associations on a daily basis and sometimes even during peak periods are common occurrences.

The minibus taxi industry nevertheless appears to provide a comprehensive yet flexible and affordable public transport service for its customers.

Two main methods of minibus taxi operation occur in eThekweni. These are described as follows:

1. Loading passengers at a designated formal / informal rank or stop. Passengers arrive at the rank or stop and board the taxi to their destination. Both major and minor destinations are usually served from the rank. Passengers either walk to the rank or a feeder service is provided by the taxi association from the residential area to the rank. This method of operation usually occurs in higher density residential areas where walking distances to the rank are relatively short.
2. A roving pick-up service whereby minibus taxis rove haphazardly through a residential or employment area picking up passengers to a specific destination until the taxi is full and then it departs for that destination. This type of service is used mainly for major, high passenger volume destinations and hence often occurs even if the area contains a formal rank, which serves the minor destinations. It is not uncommon for these roving taxis to pick-up passengers for several destinations and then to drop the minor destination passengers off at a rank and collecting major destination passengers before proceeding to its destination.

##### *3.1.2 Bus Services*

Many of the bus services in eThekweni are subsidised and therefore the industry is strictly controlled by means of route and rank permits. The bus industry is thus regulated and theoretically provides scheduled services on fixed routes. On the ground, the bus operators generally provide the scheduled bus service, however, the schedule is not always adhered to and the routes are often altered to reflect changes in passenger demand over time. Informal, unsubsidized and unscheduled bus services also exist.

In some of the larger residential suburbs, buses also operate on a more or less fixed route but with no predetermined starting point along that route and no fixed time schedule in order to offer a more flexible service that can compete with the minibus taxi services.

### *3.1.3 Train Services*

As with all train service in South Africa, a scheduled commuter train service operates in eThekweni by a single service provider along three main commuter lines. These services operate to fixed schedules, which are rigidly followed.

## 3.2 Problems encountered

The more significant problems encountered during the project are listed briefly below:

### *3.2.1 Preplanning*

- Communication within the taxi industry both along the line functions within an association and across the hierarchy of a group of associations is generally poor, although this is improving.
- Distrust both within the taxi industry and of those allied to the taxi industry is rife with the result that the project team were sometimes not told information that was vital to the pre-planning of the surveys.
- The taxi owners, association leaders and rank managers believe that they know how their services operate, however, in many instances they do not.
- The bus operators also believe that they know which services they provide on a daily basis, however, in many instances services are not provided or alternative services are provided.
- Differing interpretation of the many minibus taxi industry terms and descriptions amongst the survey consultant, survey contractors, the association chairmen, the rank managers and the rank marshals often lead to complete misunderstandings of many issues.

### *3.2.2 Surveys*

- The decision to survey linked routes for buses where a single route passes through a major interchange point and there is a significant change in passenger profile proved to be extremely problematic from a validation, capture and reporting perspective.
- Split fleets where one fleet operates on say Mondays, Wednesday and Friday and the other fleet operates on a Tuesday, Thursday and the weekend, alternating each week makes it very difficult to obtain route utilisation values, particularly if the survey team is not advised that the fleet is split and the area is only surveyed in one day.
- Due to the vast number of ranks and areas that needed to be surveyed as well as the distances that needed to be travelled, it would have been practically

very time consuming and hence very costly to undertake a detailed pre-survey evaluation during the peak period of each location before it was surveyed. As such, many locations were pre-surveyed during off-peak periods with the number of destinations and the modus operandi obtained from the rank manager and drivers.

Quite often this information was proved to be incorrect on the survey day with the result that some surveys were over-staffed and others were under-staffed.

- Overlapping boundaries of adjacent taxi associations resulting in under reporting of trips from that area.
- Drivers advising enumerators of their intended route and then actually traveling along a completely different route.
- Uncooperative drivers, particularly where there are alternative routes between an origin and destination.
- Buses not sticking to their scheduled routes.
- Bus schedules of many of the operators including the larger ones were outdated.

### *3.2.3 Form Validation*

- There was insufficient liaison between the survey contractors and the capture team during form validation, resulting in forms being incorrectly allocated.
- The survey contractors did not fill the forms in correctly and dates times and number plate information was often missing or incomplete. This required a lot of effort during the forma validation process.
- The enumerators often used colloquial names of areas, ranks and stops resulted in data captured to the incorrect facility.

### *3.2.4 Data Capture and Validation*

- There was insufficient liaison between the survey contractors and the capture team during data capture and validation, which was due to a lack of availability of the survey contractors in many instances. This resulted in data being incorrectly captured.
- Due to the many unknown factors the degree of accuracy and the level of confidence in the minibus taxi survey results is essentially unknown.
- Some ranks and stops were known by several names and some names were used for several ranks often located in completely different areas.

### *3.2.5 PTMIS System*

- The PTMIS system required more input from the end users and transportation practitioners during the development stage as. While the programme is extremely powerful and versatile, able to produce extensive statistical reports and maps, and satisfies the requirements of national legislation; it is not an easy programme to use in detailed planning and operational analyses.



### 3.2.6 General

- A coordinating project manager was required at the “coal face” level to ensure that there was continuity throughout the process between the three consultants and the survey contractors.
- The debriefing by the contractors did sometimes not co-incide with the actual survey results, which resulted in the taxi route network having to be amended.
- Delays in formalising agreements with the taxi industry had a significant adverse impact on the survey programme for the project. This in turn definitely affected the time available and hence thoroughness of all tasks that followed on from the surveys.

### 3.3 Effectiveness of the procedures and methodology

For the bus services, the survey procedure and methodology worked fairly well as most of the bus services operated to some form of schedule and routing. The proportion of trips surveyed and captured compared to the schedule was therefore high. In many instances, new bus services that were not on any schedule were also surveyed and captured.

Given the time constraints and to a lesser extent the budget constraints, the procedures and methodology adopted for surveying the taxi services were probably the best that could be achieved. Even after a detailed pre-survey analysis undertaken during the site visit and interviews with the relevant rank managers and marshalls, the survey contractors were often confronted with a completely different method of operation during the survey period. As such, the contractors had to make adjustments on site and attempt to survey what was actually occurring on the ground.

The procedure and methodology for the rail services also worked fairly well as the data appears to be accurate and reliable. This data also had to be validated and refined into the format required by the PTMIS system.

There was however no single person responsible for ensuring that the information that was surveyed was correctly validated and captured. The information / forms were passed from the one team to another with no one with the responsibility of ensuring that the team receiving the information knew exactly what they were receiving and if there were any distinctions that needed to be made.

## **4. RESULTS AND ANALYSIS**

### 4.1 Summary data and statistics

FACILITIES	NUMBER OF
Bus Only	258
Taxis Only	264
Bus & Taxis	72
Rail Stations	100
<b>TOTAL NUMBER OF FACILITIES</b>	<b>694</b>

OPERATORS	BUS	TAXI
Operators / Associations	54	117

ROUTES	BUS	TAXI
Scheduled routes	1629	1730
Scheduled routes surveyed	1137	945
Scheduled routes without trip data	492	785

VEHICLES	BUS	TAXI
Unique vehicles: 3 hour am and pm survey periods	1516	9073
Unique vehicles: am 3 hour survey period	1198	7122
Unique vehicles: pm 3 hour survey period	970	5685

VEHICLE TRIPS	BUS	TAXI
am and pm 3 hour survey periods	3815	24279
am 3 hour survey period	2236	13613
am peak hour	1631	7389
pm 3 hour survey period	1579	10666
pm peak hour	1109	5332

PASSENGERS	BUS	TAXI
am and pm 3 hour survey periods	227 718	319 785
am 3 hour survey period	133 601	164 831
am peak hour	103 234	94 494
pm 3 hour survey period	94 117	154 954
pm peak hour	68 995	78 345

RECORDS	BUS	TAXI
Total number of Records received	7000	45000
Total Number of Records captured	6300	41300
Total Number of Records rejected (mainly duplicates)	700	3700

#### 4.2 Comparison with other city municipalities

A summary comparison of a few key indicators between eThekweni, Cape Town and Joburg is given below:

FACILITIES	eTHEKWINI	CAPE TOWN	JOBURG
Bus Only	258	36	-
Taxis Only	264	46	374
Bus & Taxis	72	34	-
TOTAL NUMBER OF FACILITIES	594	116	-

	eTHEKWINI		CAPE TOWN		JOBURG	
	Bus	Taxi	Bus	Taxi	Bus	Taxi
Operators / Associations	54	117	2	174	-	30
Unique Vehicles	1516	9073	852	7467	-	12354

Joburg Reference - Joburg ITP

Cape Town Reference - Reggie Springler & Moegamad Fortune

## 5. COSTS

### 5.1 Total costs by phase

The total costs at present day (2004) values of each phase of the study in Rands including VAT are given in the table below:

PHASE	COSTS (Rands Inc VAT)	
	Individual Costs	Total Cost Per Phase
PHASE 1 : INVESTIGATION INTO DATA REQUIREMENTS FOR CPTR AND OLS Time Period : 6 Months		R 150 000,00
Consultant	R150 000,00	
PHASE 2 : PILOT STUDY Time Period : 6 Months		R 855 000,00
Lead Consultant	R 400 000,00	
Survey Consultant	R 100 000,00	
PTMIS Consultant	R 75 000,00	
Survey Contractors	R 235 000,00	
Data Capture	R 15 000,00	
Taxi Industry Liaison	R 30 000,00	
PHASE 3 : FULL PROJECT Time Period : Two years and 6 months		R4 420 000,00
Survey Consultant	R 885 000,00	
GIS / Routes Consultant	R 855 000,00	
PTMIS Consultant	R 575 000,00	
Survey Contractors	R 1 735 000,00	
Taxi Industry Liaison	R 155 000,00	
Data Capture	R 215 000,00	
TOTAL CPTR COSTS Time Period : Three years and six months		R5 425 000,00

### 5.2 Unit costs

Based on the above total cost for the entire project, the unit costs for the CPTR are given below:

Cost per surveyed record	:	R 104,00
Cost per validated record	:	R 114,00
Cost per vehicle trip	:	R 193,00
Cost per unique vehicle	:	R 512,00
Average Cost per facility	:	R 9 133,00
Average Cost per association / operator	:	R31 000,00

### 5.3 Comparison with other industries

The cost of data collection, validation and capture in other industries varies considerably and is dependant on the type and extent of the surveys. A short consumer interview survey in a supermarket for example is significantly cheaper than a census interview survey at a place of residence.

For market research the average cost to conduct an interview, validate the information, capture the data into a database and produce a report appears to be around R75,00 per survey form, which is approximately 35% cheaper than the CPTR process. Depending on the complexity of the survey form, rates of around R100,00 per survey form are not uncommon which is still cheaper than the CPTR process.

#### 5.4 Cost effectiveness of the procedures and methodology

The above figures seem to indicate that the procedures and methodology adopted to obtain the information required in accordance with national legislation were very costly. Given the unregulated nature of the taxi industry coupled with a lack of understanding of the methods of operation even within the industry itself, it is difficult to see where any short cuts could have been taken in order to obtain the required information more cost effectively.

The only other options that may be more cost effective are;

- cordon screenline counts input to an origin – destination matrix process.
- Electronic GPS technology
- Video surveillance coupled with desktop number plate matching

These methods, however, do not give any facility utilisation data and would have required many assumptions that would not have stood the test of scrutiny in the during route and facility conflicts between rival operators and associations.

## **6. CONCLUSIONS**

In conclusion the eThekweni CPTR process has been a very comprehensive and costly data collection exercise that has allowed the eThekweni Municipality to satisfy the requirements of the National Land Transport Transition Act 2000 and that has produce extremely useful for the Operating Licence Strategy, Public Transport Plan and the Integrated Transport Plan.

Due to the unscheduled and unplanned operational nature of the taxi industry it is very difficult to establish whether all the required data has been surveyed and captured and if so what the level of accuracy of the data is.

The CPTR has a set of predefined categories and tables and in many cases, the current method of operation of the taxi industry does not “fit” into this predefined framework. The roving taxi services have no fixed origin point, often do not stick to the formal road network and cannot be surveyed for waiting for waiting times. They can only be picked up at screenlines and then their destination, passenger load and route are difficult to determine.

Despite these limitations and relatively high costs, the CPTR data is proving to be very useful for the public transport operational analyses and planning aspects that the eThekweni Transport Authority are involved in.

The key challenges for eThekwini will be to keep this data current at acceptable costs. All of the tasks associated with the CPTR are labour intensive and are hence costly as skilled labour is required. More technology advanced methods of obtaining the required data need to be explored.

## **APPENDIX A : LIST OF SURVEY FORMS USED FOR THE ETHEKWINI CPTR**

Form 1	Facilities Inventory
Form 2	Bus Routes Origins - Destinations
Form 3	Taxi Routes Origins - Destinations
Form 4	Bus Route Description
Form 5	Bus Route Faretable and Timetable
Form 6	Taxi Route Description
Form 7	Taxi Faretable
Form 8	Bus Trip Origin – Destination & Passenger Load Survey
Form 9	Taxi Trip Multiple Destination Roving Service Survey
Form 10	Taxi Trip Single Destination Survey
Form 11	Holding Area Off-Peak Utilisation Survey
Form 12	Formal Off Street Rank – Utilisation Survey by Loading Point
Form 13	Formal On-Street Rank Utilisation Survey by Destination
Form 14	Passenger Waiting Time Survey
Form 15	Rail Station Facilities Inventory