THE UCT STUDENT AND STAFF TRANSPORT SYSTEM A CASE STUDY

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ABSTRACT

For over 30 years the University of Cape Town has arranged transport services for its students and staff, particularly for those in University residences. These services were managed by the operators, cash fares being payable on many routes. A review of the development strategy for the University brought transport issues to the fore and a complete revision of the UCT student and staff transport system was undertaken. Key objectives included reduced private car usage and improved opportunities for the many historically disadvantaged students at the University. A transport levy on all students, of less than half the previous regular-user's cash fare, encourages a transfer from private transport and benefits poorer students through subsidisation from car users. An 18-month planning period resulted in a new, UCT managed, fully scheduled service, using dedicated vehicles, coming into operation in January 2005. The number of vehicles was reduced to less than half that previously employed, ridership more or less doubled to about twenty five thousand boardings per day and the total cost of the system was reduced by about 20% per annum. This paper describes the design and operation of the new system.

1. INTRODUCTION

The University of Cape Town, which can trace its history back about 176 years has, like many universities, grown in such a manner as to result in a somewhat fragmented campus. UCT in fact has four significant focus areas, being the Main Campus against the slopes of Table Mountain above Rosebank, the Health Sciences Faculty on the Groote Schuur Hospital precinct, the Hiddingh Campus in the Gardens area of Cape Town and the Graduate Business School in the V&A Waterfront. The main campus, shown in Figure 1, is the one with which most will be familiar, being a Heritage Site overlooking the Greater Cape Town Metropolitan Area from its position on the mountainside. This location, whilst spectacular, has its problems – space and non-motorised accessibility being the two of consequence to this discussion.

Space is a problem because, after 176 years, most of the available land has been taken up and, except to the East, the surroundings are National Parks land. Space for parking is thus at a premium and competes with land for additional academic and other facilities. Non-motorised accessibility is an issue for two reasons. The one is the steep slope on which the University is built. Whilst certainly walkable, the hill is not inconsequential when encumbered by loads of books or riding a bicycle. It is also not that pleasant a walk in a strong wet northwesterly winter wind. The other reason is that many of the University Student residences and some of the academic campuses are just out of reasonable walking distance of each other, in a couple of cases, aggravated by two major metropolitan motorways dividing sections of the campus.

Figure 1. Looking towards Jameson Hall, Main Campus, UCT.

For many years, the private bus operator responsible for providing metropolitan services also provided for the transport needs of the University community. This was naturally supported by rail access to Rosebank Station. Scheduled buses operated from the local railway stations, Mowbray, Rondebosch and Claremont, and to the Cape Town CBD as part of the service. Problems crept in over the years however. Schedules were not always adhered to, buses got older and the hills seemed to get steeper, the university grew and the needs expanded. Finally, in the mid 90s, the bus operator ceased to provide services on campus. The gap was taken up by an enterprising security guard who drew on his mini-bus taxi driving friends and acquired the contract to provide transport services to the University. This proved to be a great success and became known as the "**Jammie Shuttle**." The nature of the contract was that students in official residences out of walking distance of Main Campus were sponsored by the University and produced a voucher to make a trip. The operator was then paid a contract fee for providing these particular services. Everyone else using the system paid a cash fare directly to the operator. At the end of 2004, this contract was worth between R 10 million and R 15 million per annum – the operator was not very specific about this. A considerable portion of this came from cash fares and departmental payments rather than from UCT transport administration.

In 2003, having been engaged with other transport related work at UCT, Ninham Shand were asked to investigate some issues around renewing the current operational contracts and legalisation of the transport services in terms of the NLTTA. This was done, but in the process some inefficiencies were identified. The Properties and Services Department of UCT took note of these and asked that NS investigate improvements. This set the scene for the design process leading to the new system.

2. THE DESIGN CONCEPTS

2.1 The Overarching Design Philosophy

In seeking to address a revised Student and Staff Transport System, (SSTS) contract, fairly simple but important concepts were set:

- Provide safe and secure scheduled services linking all UCT residences with the main UCT facilities 18 hours a day, seven days a week.
- Keep operations clean and quiet.
- Shift modal split from private to public transport.

There were other requirements, but these were mainly at the operational level relating to on-campus roads available to the service, pedestrianisation being something of an objective on Upper Campus.

2.2 Demand Levels

The study started out with an evaluation of the existing records of demand, from the Jammie Shuttle operator, in conjunction with the University database of student and staff residential addresses – neither of which were particularly reliable except in respect of formal University residences. The information nevertheless gave a general sense of the demand patterns for the University and enabled the preparation of a reasonably detailed operational design that met the needs of the University and linked into the Metropolitan public transport system at key points, such as Claremont and Mowbray interchanges; the Lansdowne and Klipfontein Corridors respectively. At this stage, total weekday boardings of between 13- and 14 000 per day were expected during the first year or two of operation, growing to about 18 000 per day over a five-year period.

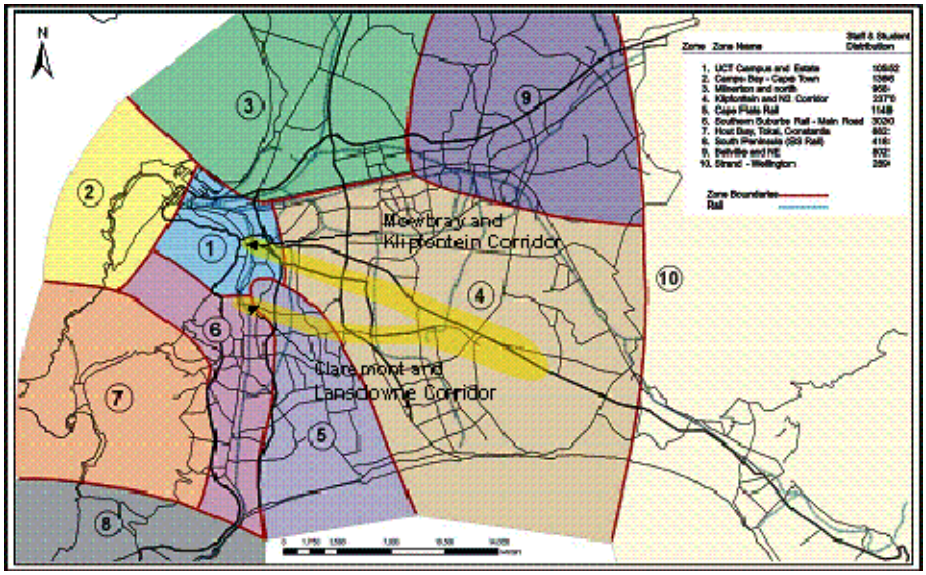

Figure 2: The Metropolitan environment and major transport areas.

The primary demand areas deriving from this study are shown in Figure 2.

2.3 Detailed Design Policies

There were not many detailed policies influencing the system design. There were a few however:

- 15 minute maximum headways during peak periods
- 30 minute maximum headways during weekday day and early evening off-peak periods
- 60 minute maximum headways during night and weekend off-peak periods
- Capacity satisfaction at all times
- Limited vehicle size (the University was not keen on large buses on Campus, influenced perhaps by perceptions of the Metropolitan bus service, which is not a thing of great beauty.)
- Limited route range; i.e. no scheduled services beyond certain key boundaries
- Timetables should enable reasonable transfer between classes.

These simple parameters were used to guide the vehicle selection and scheduling.

2.4 Routing

In most respects, the routes being operated under the existing contracts reflected the primary movement patterns of the students and staff, within the bounds of the operations. There were however a couple of problems:

- Jammie Shuttle vehicles were using narrow residential streets to avoid traffic
- Some key transfer points for users of Metropolitan Public transport were not being served

In addition, one of the objectives of the system review was to examine ways of reducing reliance on on-campus parking for private vehicles. This of course, led to the investigation of off-campus parking that would not elicit irate phone calls from residents who were now parked into their own properties. A number of options were investigated, amongst them, the use of Newlands Rugby ground parking, this particular suggestion proved uneconomical, but two other good sites did surface, one adjacent to a new student residence and the other linked to the concept of a one-stop drop and ride facility for parents dropping off kids at local schools. The drop-n-ride concept also recommended another new route, also included in the design process. More about this later.

The route system arising out of these deliberations is shown in Figure 3.

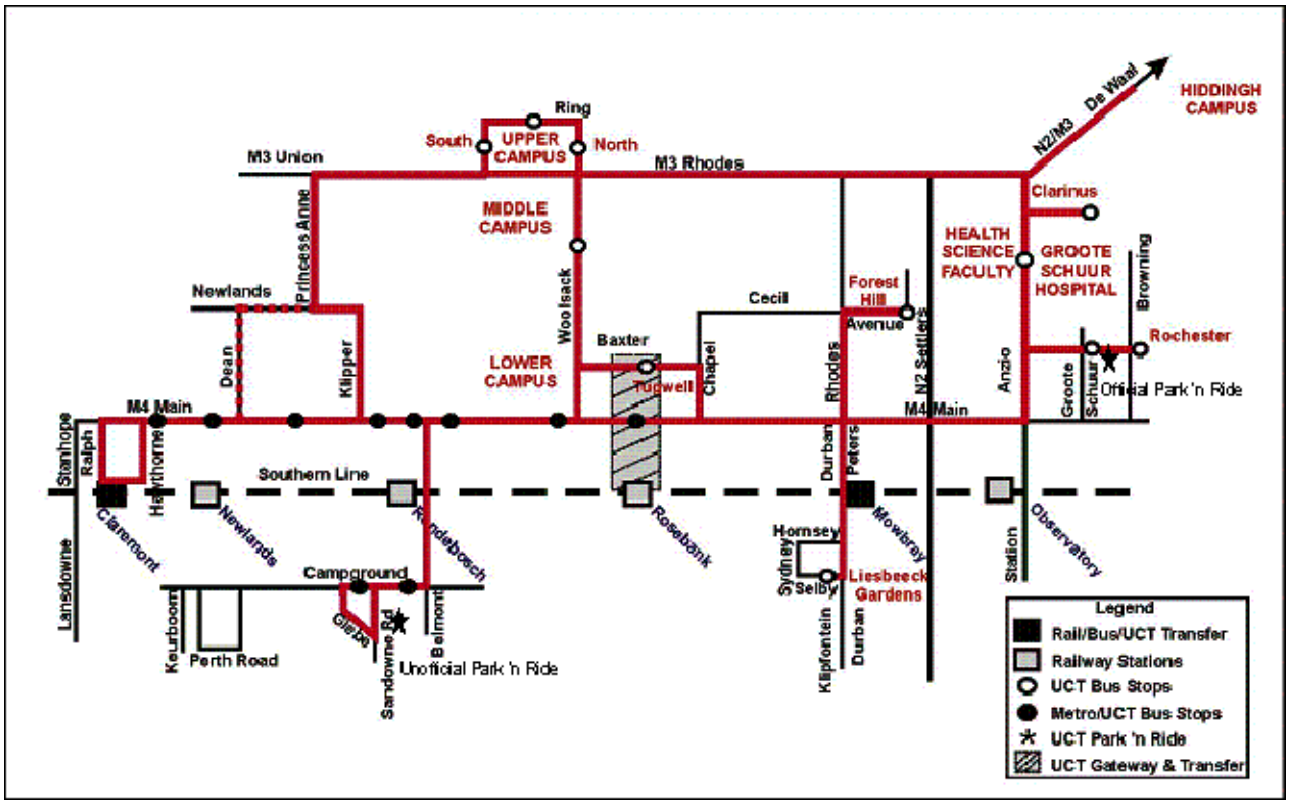

Figure 3. The UCT SSTS Route Network.

2.5 Vehicle Selection

With the concept routes in hand, and some estimate of temporal route demand, the selection of vehicles was taken up. The existing fleet comprised a ragtag assembly of dedicated and morning peak hire vehicles ranging from 9-passenger Toyota Ventures, through to 60-passenger buses with the majority being the standard 14-passenger mini-bus taxi. A few 22-seat Sprinters and Ivecos were in operation as well. In all as many as 49 vehicles would operate during morning-peak periods, about 39 of them being part of the permanent fleet.

Figure 4: The old Jammie Shuttle in action.

First discussions revolved around low floor buses able to accommodate bicycles and wheel chairs. Whilst highly desirable, it was quickly apparent that such buses were not going to feature in this contract. Low floor bus prices are high, the vehicles are not that readily available locally, certainly not to test drive on site, and the UCT terrain is not ideal. Buses on bus chassis instead of truck chassis would however, have been a great bonus, but this was not to be. This made wheelchair access a whole new ballgame as well and so that also went. As far as bicycles were concerned, between legislative, size and operational performance issues, this proved to be impractical although achieved elsewhere in the world.

Given the policy of cleanliness and quietness, linked with the mountainous terrain of the Main Campus, vehicle selection started with ensuring that the vehicles had engines with a suitable environmental rating and Euro II was specified as the minimum. The next thing of course was a suitable power to weight ratio. These were the simple matters. The question now arose as to the relative importance of employment versus long-term cost. Should the vehicles be 18 and 22 seaters or should larger vehicles be used, what mix, diesel or petrol and so on?

The first thing that was readily determined was that diesel would be the better option. The short distance routes in urban traffic and a mountainous environment are far better served by the diesel than the petrol engine. Diesels in this environment are also less prone to fuel theft problems. In considering vehicle size, employment looks like an issue, until one examines operating hours and working hours. Then it transpires that moving from the taxi type operation to a structured operation with larger vehicles has limited impact on employment, as each vehicle typically requires two drivers for an 18-hour service, allowing for peak and off-peak vehicle usage.

In reviewing the demand patterns in conjunction with policy service frequencies and vehicle operating costs, it quickly became apparent that the fleet had to use larger vehicles – 35-passenger and 60-passenger vehicles were the capacities identified. Smaller vehicles very quickly raise operating costs significantly. So of course do unnecessarily large vehicles. A spreadsheet solver type approach was used to determine the best fleet mix based on a small selection of vehicles and gave rise to the above vehicle sizes being most appropriate – 18 of the smaller ones and 2 of the larger ones. This comprehensive but actually quite simple spreadsheet model takes into account the full operating and overhead costs of a vehicle making appropriate allowance for actual mileage, multiple drivers and split driver shifts. It should be noted that the model was quite sensitive to changes near the optimum so that 16 smaller and 4 larger vehicles looked like a better option with only minor changes in demand or estimated cycle time. UCT did not want big vehicles on campus, so the result was to go for the smaller vehicles. 20 vehicles though, looked to be the ideal fleet size.

2.6 Fare Recovery

An important distinction between the Jammie Shuttle and a conventional public transport system, and one of which we are aware in promoting public transport, is that fare recovery need not be by means of cash fares or even of prepaid weekly or monthly tickets. In fact, after months of debate during the design of the system, it was agreed to make the system "free" to users. Of course, there is no such thing as a free ride and the system is instead funded through a transport levy on all students and on staff who register to use the system. The philosophy is simple enough. Car users pay twice, once for the bus they don't use and again for the parking they do use. Everyone else pays once. The financially disadvantaged pay, but because it is part of the fee structure, through bursary or student loan funding. The advantage is that they are subsidised and can travel all year for about R200. This mechanism also eliminates discrimination against those who really cannot afford the cash and therefore have to walk or miss class or other activities because of transport problems. Every registered student can use the system on display of a student card – so no matter how poor you are, you are able to board the bus just like the richest student on campus.

As an aside on this, one of the success stories comes to us from the UCT Director of Properties and Services who received a letter from a Professor renowned for criticism of University Services:

Student marks appeared to have improved and the professor wanted to know why: A survey revealed that students felt that the new bus service enabled them to access the library, computer rooms and other academic services far more extensively than before – being "free," and this enabled them to study more effectively and thus achieve better results.

3. BRANDING AND LIVERY

Something that has been known to bring all development to a halt is the branding and livery of public transport vehicles. Fortunately, this was not the case at UCT where the livery was in fact very carefully planned by the University. The buses, as seen in Figure 7, are light blue with a new and distinctive Jammie Shuttle logo. It was decided that the name Jammie Shuttle would be retained even though the service is very different from what went before. The livery extended from the buses, through the bus stop signs and timetables, to the uniforms worn by the operator's staff whose uniform, while off-the-shelf, has been embroidered with the Jammie Shuttle logo. This might all seem somewhat over the top and irrelevant but the value of this branding is not to be underestimated. The Jammie Shuttle vehicles are now something of a landmark in their own right and the branding of vehicles and staff offers a sense of security to both users and local residents. The branding also serves another purpose – it is quite impossible for these vehicles to be used anywhere except where authorised, sticking out of the regular traffic as they do. This visibility is good in another way as well; traffic officers are familiar with the vehicles and their function – allowing better cooperation all around.

Figure 5: A UCT SSTS Bus driver in uniform.

4. THE TENDER

In commencing this section, it is appropriate to give credit where credit is due and to stress that the pre-2005 operator had actually provided an excellent service to the University. The restructuring of the Jammie Shuttle service was due to the growth of the University and the need to adapt transport services in accordance with various development plans. In fairness to that operator, it was suggested that the new contract be directly negotiated with him, with a phased changeover of fleet. The University preferred however, in the interests of transparency, to go to tender, giving the current operator a 7.5% benefit. From the University's perspective this proved to be beneficial, as shall be seen.

Approximately 27 entities drew documents for preferred bidders, of which about half were returned. Seven firms drew tender documents and only four finally submitted tenders, one late, so that only three came into contention for the contract. And here was a shock for the consultants – two of the tenders, including the one from the incumbent operator in joint venture with another quite significant bus operator, came in at nearly twice the estimated cost. Relief set in however, when no fault could be found with the third tender, which was only marginally more than projected and included two dedicated standby vehicles. This tenderer had reached a cooperative agreement with the bus manufacturers and was able to tender good vehicle prices. (These prices were similar to those offered by manufacturers to the University during the design phase but lower than offered to some other tenderers.) A lesson is to be derived from this experience – check precisely what effect the client name has on the vehicle pricing. Of course, underestimating price and overestimating demand in public transport design is considered, in some circles, to be more or less standard practice. One does not like to make mistakes though, and it really was a shock, after extensive and detailed calculations to find that some operators saw matters quite so differently.

A feature of the tender of considerable note, was that aside from bringing the vehicle suppliers in as partners represented at the tender hearing, the successful tenderer offered vehicles that ultimately offered considerably more capacity than specified. The reality is that there are 33-passenger buses and then 35-seater buses. And they are very different in total capacity. The 33-passenger bus is just that. The 35-seat bus, with internal modifications to allow standees may carry up to 59-passengers legally, although 45 is

somewhat more practical physically. The specification called for 35 passenger vehicles but the vehicle model specified as a type for general style and appearance was strictly speaking, only a 33-passenger vehicle although salesmen always insisted that the two extra passengers could be fitted in. This tenderer noted the difference and offered an appropriate vehicle. An almost identical situation arose with the 60-passenger vehicles and the buses actually in use are legal to about 90 passengers. This turned out to be a very fortunate circumstance. Earlier, we mentioned that the service was originally designed for 13000-14000 daily boardings with a medium term target of 18000 boardings. During the third term of 2005, the operator was regularly measuring in excess of 25000 boardings per day, achieving about 26500 on occasion, with a 20-vehicle fleet. The 35 and 60 passenger vehicles would probably not have coped with this demand.

5. IMPLEMENTATION

Few projects are without hiccups, and this one was no exception. The design had been long completed and publicised, public pre-tender calls had been made, invited tender had followed, the tender price matched the proposed budget – and someone in the University hierarchy felt that the process had not been sufficiently transparent, had not adequately allowed for HDI involvement and so on. The successful tender was in fact 100% HDI but this perception in the democracy of the University, resulted in a delay of over six weeks in the appointment of the tenderer. This just happened to be at a critical time in the bus manufacturers schedule and the order for the new fleet went in just after the order from somewhere else for several hundred double deck buses. The contract was due to commence in literally weeks, and there was absolutely no chance of new buses being delivered. Fortunately, the operator relationship with the vehicle supplier that gave rise to the tender price, again saved the day. A fleet of appropriate buses, of the same model but of different configuration to those accepted in the tender, was made available on lease, pending the arrival of the new vehicles.

Figure 6: Some of the temporary fleet in action early in 2005. Note the queue of buses in the morning–peak in the upper section of the picture.

Operations commenced on schedule on 3 January 2005. Of course, there were no students, so there was no real pressure, giving the operator a chance to become familiar with the environment and get everything set up. And it is good that this time was available because low trees, incomplete road alterations and lack of driver experience resulted in a number of minor dings and dents and quite a lot of multi-manoeuvre turns.

Real operations got under way a few weeks later as residences started to open and students started to arrive. In spite of attempts to create detailed timetables in advance, the almost daily change in needs necessitated a highly flexible arrangement, with operating instructions being issued more or less live by the UCT Transport Administrator. And there were problems – drivers getting lost, not understanding instructions, users being unfamiliar with the new system, improperly marked vehicles, inappropriate bus doors for the particular duty and so on.

In fact, operations settled down reasonably quickly albeit with little problems occurring quite regularly as everyone got used to the new arrangements. A few months into operations however, things seemed to go pear shaped. Suddenly there were mutterings from the student body that the system was hopeless and did not address the needs of the students at all. The Deputy Vice-Chancellor became involved as the Student Representative Council threatened mass action. What was the problem? All sorts of claims were made, but few were sufficiently concise or specific to follow up. Generally though, students had to wait too long, there was not space on the buses, the timetables were not available etc. It was thus decided that detailed queue length, waiting time and face to face surveys would be conducted, much of the work done by the students themselves, paid by the University. The SRC arranged most of the survey work so that there could be no accusation of bias. And the findings were very interesting.

Although there were problems requiring attention, some quite serious, it turned out that approximately 66% of students believed that the service was an improvement over what had gone before. 11% were indifferent and about 23% thought there was deterioration. Queue lengths were sometimes enormous; over 300 people in a queue, but waiting times were typically less than 5 minutes in these circumstances, 30% of people waiting no longer than 2 minutes. Notwithstanding this, the University asked the operator to bring in extra vehicles pending the arrival of the vehicles ordered for the University system. This they did and for a while, five 90-passenger buses operated in the fleet that was however, 2 short on the smaller vehicles and a couple of these were only 28 passenger vehicles.

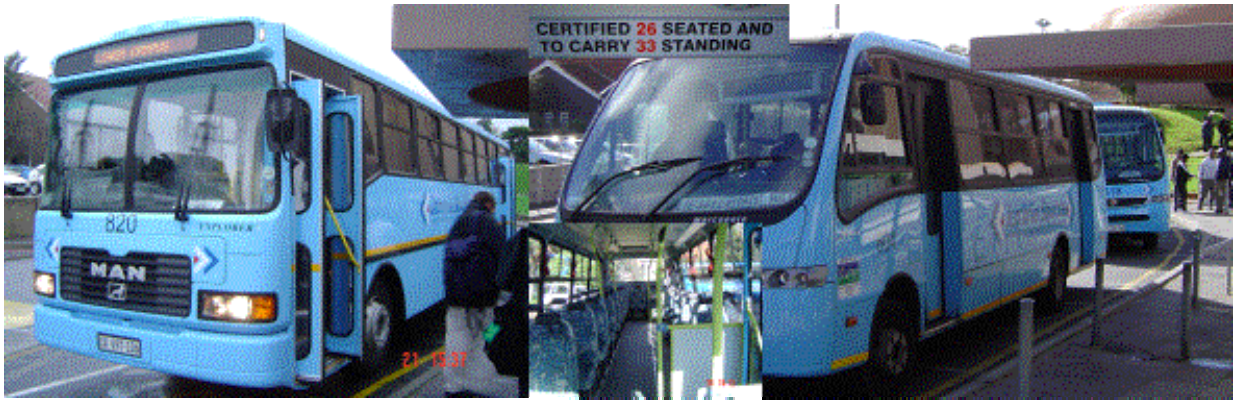

Figure 7. The UCT SSTS buses. The 90 passenger vehicle is on the left. The bus on the right has a theoretical capacity of 59-passengers, but 45 is a more realistic loading.

With the results of their own survey contradicting the claim that the service was a disaster and agreement on the changes necessitated to improve matters – particularly those relating to student discipline in relation to the use of the system, the SRC backed down and things settled down to a more normal basis again, albeit with a number of minor alterations. The most important of these was introducing a load and go operation during the morning peak, not even attempting to keep to a timetable. With inter-bus times being

between 4 and 15 minutes on most routes anyway, this was not an issue. Nearly as important was limiting certain upper campus stops to certain destinations as a big problem being encountered by students, and the one probably giving rise to the largest number of complaints was that students for local destinations were filling vehicles for the more distant destinations, thus preventing the longer distance travellers from making the trip. Some minor changes to bus stop signage and a bit of education seemed to eliminate this problem.

These minor changes coincided with the arrival of the new vehicles. The capacity of the individual vehicles, externally identical, went up by about 30%, the correctly configured fleet allowed appropriate assignment to routes while the two-door arrangement greatly enhanced alighting times. As driver familiarity improved, so did cycle times and this also allowed for some improvements.

5.1 The Minibus Taxi Industry

So far, we have focused on internal matters as if this was the only issue. In fact, there were some other problems that have remained with us and affect operations today, 18 months after commencing services.

In spite of the public tender process and the fact that some taxi operators had collected tender documents, the local minibus taxi industry had made no attempt to bid for the project. Now that the system was clearly an event, there was a sudden rush to block operations on the basis that the minibus taxi industry would lose business – significantly more by their estimates than ours. A new taxi association was formed specifically to deal with the perceived threat of the new Jammie Shuttle service. Delegations were sent to the City authorities to try to prevent approval of the UCT system, and at meetings held between the new Association and the University, veiled and not such veiled threats were made against students should certain services operate.

For other reasons, there were delays with the award of the operating licence, but when the licence was finally granted, it did in fact allow UCT to operate the Jammie Shuttle service on all designed routes. However, in the interests of student safety, two routes have not been operated although both have been tested. These routes are the Claremont and Dean Street routes that are perceived to steal taxi business from Main Road. This is hopefully going to change in 2006.

6. PARK ‘ RIDE – DROP ‘N RIDE

It will be recalled that one of the goals of upgrading the Jammie Shuttle was to try to cut back on private car usage on Upper Campus. The likely success of this campaign was always in question and it was generally felt that it would be a year or two before there was a measurable impact. However, planning included allowance for park ’n ride and drop ‘n ride so that these could be promoted in the long run. The first to come into operation was in fact intended as a drop ‘n ride service adjacent to a group of high schools about 5 kilometres from the University. Parents could now drop off both university and school going children at one stop. This worked to some extent, not accurately measured, but what did happen was that students picked up on a local parking area only really used over the weekend for church and local fairs. This route quite quickly became as busy as any other, with students leaving their cars well off campus and taking the Shuttle the last few kilometres. No parking problems, no tickets, no time problems.

7. UNIVERSAL ACCESSIBILITY

Whilst only a small group, UCT does have a disabled community and caters for this group through its Disability Unit. Initially, it was felt that the main services would cater only in a limited way for those not using wheelchairs and no wheelchair access would be provided. However, as the design process progressed, so the level of support for the disabled services grew. Whilst wheelchair access remained out of the picture, simple but effective innovations were suggested and subsequently implemented on all the Jammie Shuttle buses:

- Buzzers in the steps of the passenger doors indicate that the door is open and the step position to the blind passenger.
- Bright yellow handrails on the doors and in the bus help the partially sighted and aided those with other mobility difficulties.
- Braille like markings on the handrails in the bus indicate the position of the doors for the blind.
- A small adjustment to the seat positions and a simple sign make provision for guide dogs and their owners to sit just behind the driver, near the bus entrance. This also provides space for those with crutches.
- A light as well as a bell for the stop-call button indicate to the deaf that the call has been registered.

An interesting observation arising out of these features is that many disabled users are now very much part of the general community, requiring almost no assistance, something greatly appreciated by most. It is our understanding that there are a few blind users who are now so familiar with the system that the casual observer would not know that they were in any way disabled to watch them use the bus service. Even the guide dogs seem to have adapted well in spite of the unfortunately steep stairs on the buses. (Truck chassis are really not ideal for public transport vehicles.)

Whilst wheelchair access to ordinary buses was investigated at the technical level, it was agreed that this was not practical. The intention was that the transport for wheelchair bound students and staff would not be included in this particular project. However, there were soon concerns expressed by the UCT Disability Unit and an additional separate contract was established with the Cape Town operators of the Dial-a-Ride service who purchased, and now operate, a wheelchair carrying vehicle in full UCT SSTS livery as part of the main Jammie Shuttle service, except under direction from the Disability Unit. Again, whilst there is clearly some distinction of wheelchair bound students and staff from others, that distinction is limited through the provision of a vehicle that in most other respects looks just like part of the main fleet.

8. SOME RECENT DEVELOPMENTS

Subsequent to the system settling down to fairly stable operations, well accepted by the majority of users and other UCT community members. It was possible to take time out to re-evaluate and follow up, in detail, on other elements of the system. The original system design allowed for boarding control and global positioning system vehicle monitoring. Allowance was also made for on-vehicle closed circuit television monitoring. Once the new vehicles were in operation, the boarding control and vehicle monitoring equipment was fitted. There were however problems with the boarding control inasmuch as that mechanisms for dealing with visitors, students who had lost or forgotten their cards and boarding times in the peak were all issues not really adequately resolved. The intention to change over to smart-card technology with proximity cards has meant that there has been

little pressure to make an issue of the boarding control. What did become a matter of importance to users was on-vehicle security for off-peak times, especially at night and the vehicles were all fitted with internal video cameras that have proved to be very popular with the parents of students using the system, particularly first years who are not allowed to have motor cars on campus.

9. CONCLUSION

Whilst the 25 000 daily boardings, now being common, stretch the system to its limits and essentially represent a capacity problem and suggest that the demand estimate was less than accurate, we are actually exceedingly pleased with the user enthusiasm for the system. This enthusiasm is not just internal to UCT. Visitors from other provinces have come to inspect the system with a view to similar operations elsewhere. Locally, other tertiary institutions have expressed an interest in becoming partners in a larger tertiary institution transport system. Such a generic system would of course, eliminate the branding and unique advantage so valuable to UCT.

A great deal has been learnt from this project, on subjects as diverse as vehicle costing, user habits and provision for the disabled, and we will be taking these lessons with us into other projects. We believe though, that in spite of minor difficulties, the system has been an outstanding success that demonstrates our very firm belief that public transport can be effective and efficient.