On-Campus Parking: Problems and Solutions

by

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A Masters Project submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Master of Regional Planning in the Department of City and Regional Planning.

Chapel Hill

2006

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ADVISOR
Abstract

Parking on the UNC-Chapel Hill campus has long been a difficult proposition. Rising student enrolment and the necessary additional faculty and support staff have increased demand for parking. The campus is ill-equipped to accommodate this increase, and projected campus population growth will only exacerbate the problem.

The background to the current parking situation is analysed within the framework of the Campus Master Plan and the Comprehensive Plan, two documents that guide current and future development on campus. This analysis showed that there would be little net increase in parking provision and future growth is expected to be accommodated using alternative transportation modes. Past trends and future changes are also considered and an ongoing trend towards students and employees living farther from campus is identified. The problem is then defined in detail.

A number of potential solutions are proposed; these include strategies for reducing demand, increasing supply, and better utilising existing parking stock. Also proposed is a park and ride availability information system, which is an intelligent transportation system intended to reduce commuter frustration and even distribution among satellite park and ride facilities. Finally, strategies for improving dissemination of information about existing alternative transportation options are discussed.
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1 Introduction

1.1 Purpose of project
Parking on the UNC-Chapel Hill campus has long been a difficult proposition. This project is intended to research and analyse the extent of the problem and investigate possible solutions to help ease the situation.

1.2 Aims & Objectives
Aim: To understand the scope of the parking problem in Chapel Hill.
Objectives:
- To determine the extent of available parking, including on-campus and park and ride locations serving campus, and the planned changes in parking availability in the near future.
- To investigate who is affected by the dearth of parking and how they are affected.

Aim: To understand the contextual background of future development in Chapel Hill and explore various technologies and theories for reducing parking pressures.
Objectives:
- Provide a synthesis of Chapel Hill and UNC’s approach to changing the way employees and students get to campus.
- Provide a literature review of relevant Advanced Traveller Information Systems (ATIS) technologies.
- Provide an explanation and literature review of social marketing and individualised marketing.

Aim: To develop a variety of options for UNC to consider and provide recommendations (based on various criteria) about which would be best for UNC.
Objectives:
- Describe ideas for reducing demand.
- Describe ideas for increasing supply.
- Describe ideas for improving information so that demand might be spread more evenly.

1.3 This paper’s organisation
This paper first gives a background on campus parking, including campus and town development goals and trends and impending changes. Next, it presents the various aspects of the parking problem at UNC and the ramifications that these problems create. It then discusses the assumptions under which the proposed solutions were developed and their rationales, followed by literature reviews of advanced traveller information systems. These are followed by detailed descriptions of the proposed solutions. Finally, the author has provided recommendations and conclusions.
2 Background

2.1 Campus Master Plan

UNC-Chapel Hill’s Campus Master Plan was developed to help guide campus growth and development for the next 50 years. In 1998, the architectural firm of Ayers Saint Gross was hired by the University to develop the new Master Plan. It was prepared using input from a wide range of stakeholders, including UNC students, staff, faculty, and administrators; the Town of Chapel Hill; town residents and local businesses. This was approved by the Board of Trustees in March 2001.¹

A main concern of the Master Plan is to create “an attractive, pedestrian-oriented campus where the impact of the automobile (whether in motion or parked) is minimised.”² The university is approaching this goal in a variety of ways:

- The transportation task force, which developed the Transportation and Parking portion of the plan, desired to minimise new parking on campus. Resident student parking will be relegated to remote lots.
- The use of transit and park and ride facilities will be promoted as alternatives to driving to campus.
- Land use is an important element. The university plans to house more students on campus, which should increase the number of students who use sustainable travel methods to get to and from classes.
- Non-motorised modes of travel, particularly walking and bicycling, will be encouraged. The university plans to make improvements to these facilities to help attract more commuters to these forms of transportation.

Of the available space on campus for new buildings, much of it is currently surface parking. Master Plan development is scheduled to relocate this surface lot capacity to multilevel decks and redevelop the land for new building sites and green spaces.

2.2 Chapel Hill’s Comprehensive Plan

Between 1998 and 2000, the Town of Chapel Hill was also busy developing a plan to shape the future. The Comprehensive Plan, developed with the input of many stakeholders, identifies the town’s goals and delineates short-, mid-, and long-range objectives. The plan recognises that the town and UNC must work closely together and take a holistic approach to solving many issues.

Chapter 10 of the Comprehensive Plan addresses the town’s approach to transportation. Among the key plans is that Chapel Hill intends to minimise roadway improvements that increase automobile capacity. Instead of expanding roads, it wants to focus heavily on improving and aggressively promoting alternative forms of travel including public transit, bicycling, and walking. However, the town recognises that future population growth at

UNC, combined with a decrease in campus parking availability and an increasing number of students and staff commuting to Chapel Hill, will displace many drivers. In order to accommodate these commuters, Chapel Hill is focusing on expanding the park & ride system and simultaneously improving the transit service that serves those locations.\(^5\)

### 2.3 Past trends

A 2002 study conducted for UNC’s Department of Public Safety (DPS) surveyed university employees and off-campus students about their commuting habits. The study compared 2001 data about commuters and their journeys with similar data from a 1997 survey. Among the most relevant commuting trends between 1997 and 2001:

- Both students and employees were moving further away from campus and spending more time commuting. However, students were still largely within the Chapel Hill-Carrboro area while employees were increasingly living in other towns, some of which were quite distant from UNC.
- Fewer students were walking & bicycling; this may be related to the fact that a smaller percentage of students were living within 2 miles of campus, which is a reasonable distance to bike.
- More students were driving alone, using P&R facilities, and taking the bus (either Chapel Hill Transit or TTA).
- Multi-modal travel was increasing, from 1.09 modes/week to 1.24 modes/week.
- The Friday Center and NC 54 lots were consistently the most popular P&R facilities among both students and employees.\(^4\)

Since the 2001 survey was conducted, few of the overriding trends have changed about student and employee mode choices. However, several factors have affected the relative attractiveness of P&R as a viable alternative to driving to campus. First, Chapel Hill’s park & ride facilities have been expanded. The Jones Ferry Road lot opened on 21 October 2002, providing 441 additional spaces in Carrboro,\(^5\) and the Friday Center lot was expanded by 500 spaces in August 2002.\(^6\) Second, Chapel Hill Transit (CHT) went fare-free in January 2002.\(^7\) Since then, bus ridership has increased dramatically.\(^8\)

### 2.4 Future changes

The opening of Ram Village in fall 2006 and the reopening of Morrison dormitory in fall 2007 will add an additional 1780 beds to on-campus housing. This will bring the total number of on-campus beds, including a few hundred spaces for graduates and student

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\(^8\) Ohlms, Peter. Personal communication. 20 March 2006.
families, to 9480.\footnote{Bradley, Rick. Personal communication. 16 March 2006.} These new dorms will help relieve some of the pressure that increased enrolment over the last few years has placed on the housing market and transit services in Chapel Hill.

In August 2006, the agreement between UNC and Triangle Transit Authority (TTA, the Triangle’s regional transportation authority) to reduce the price of a regional bus pass will change. Currently, the university subsidises the cost of TTA bus passes for students, and university and hospital employees, bringing the price down to $10 per month or $45 per semester. Starting 1 August 2006, the university will instead have 5000 year-long bus passes to give out free to members of the campus community.\footnote{Tallmadge, John. Personal communication. 17 March 2006.} For a year-round rider, this will save $110 per year. It also provides a good incentive for current drivers, both those who have campus permits and those who park and ride, to use their cars less often for their commute to campus.

Also for fall 2006, the Chapel Hill Bible Church near the corner of Sage and Erwin Roads\footnote{Chapel Hill Bible Church homepage. http://www.biblechurch.org/. Accessed 6 April 2006.} just off US 15-501 will allow their parking lot to be used during the week as a park & ride facility.\footnote{McDonough, Patrick. Personal communication. 17 March 2006.} Their sizeable lot should mean shorter journeys for park and ride commuters, since individuals using the 15-501 corridor from Durham must currently drive much further to reach a UNC or Chapel Hill P&R lot.
3 The Parking Problem

3.1 Increased demand

The Master Plan and other planning documents from the late 1990s\textsuperscript{13} note a planned student enrolment increase of 15\% between 1998 and 2008. This translates to an increase of over 3600 students in ten years, bringing the total number to nearly 27,900.\textsuperscript{14} A commensurate increase in staff and faculty is needed to support and teach those extra students. Concurrent expansion of research and health care services has also significantly increased the number of people travelling to campus on a daily basis.

Faculty

As of 30 September 2005, UNC-Chapel Hill has 3208 faculty members (those employees who hold faculty rank in their primary appointment).\textsuperscript{15} This is an additional 426 faculty members (a 15.3\% increase) who have been added since Fall 2000, when the University had 2782 faculty members.\textsuperscript{16}

Staff

The number of staff members (those categorised as EPA non-faculty and SPA staff) in Fall 2005 stood at 7828.\textsuperscript{17} This represents an increase of nearly 900 staff members over the 2000 level of 6943.\textsuperscript{18}

Students

In Fall 2005, there were 27,276 students enrolled at UNC.\textsuperscript{19} Since the fall of 2000, the number of enrolled students has risen by over 2400 from 24,872.\textsuperscript{20} For the 2005-2006

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3 The Parking Problem

Academic year, the UNC Department of Housing & Residential Education offered 7700 beds in on-campus housing for undergraduate, graduate, and student families.21

Table 1. Increase in faculty and staff members and student enrolment, 2000-2005.

| Increases in Faculty, Staff, and Students at UNC-Chapel Hill |
|-------------|-------------|-------------|--------|--------|
|            | Fall 2000   | Fall 2005   | Change | % Change |
| Faculty    | 2782        | 3208        | 426    | 15.3%   |
| Staff      | 6943        | 7828        | 885    | 12.7%   |
| Students   | 24,872      | 27,276      | 2404   | 9.7%    |
| Total      | 34,597      | 38,312      | 3715   | 10.7%   |

Other campus population growth

Two other groups have also seen significant growth. Research has become one of the university’s top priorities: between 1998 and 2005, sponsored research funding has increased 90% to $579.6 million22. As a necessary part of this growth, the university has added additional researchers and facilities.23, 24

The UNC Health Care system has also been expanding its presence on campus. In 2001, the system added two new hospitals, the NC Children's Hospital and the NC Women's Hospital, to the southern part of campus in 2001.25 Another new facility, the NC Cancer Hospital, is scheduled to open in 2009.26 These have only added to the number of UNC Health Care employees and patients travelling to the south end of campus.

3.2 Decreased parking supply

Master Plan

The original Master Plan called for a net increase of around 3000 spaces;27 however, this had been significantly reduced to 1550 net spaces by 2001.28 Since then, geological analysis of several of the proposed underground parking sites has shown that these decks would not be economically viable to construct,29 further reducing the net parking increase.

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21 Personal communication with Rick Bradley, 16 Mar 2006.
23 Moeser, Matthew. Personal communication. 25 March 2006.
29 Kapp, Paul. Personal communication. 29 March 2006.
Construction

A 1999 assessment of UNC-Chapel Hill’s facilities found nearly $700 million worth of badly-needed repairs and renovations to existing developments. The Michael K. Hooker Higher Education Facilities Financing Act was passed by the NC General Assembly and approved in a referendum by the state’s voters in November 2000. This act authorised the sale of general obligation bonds to finance new construction and make necessary improvements to existing structures across the UNC system; UNC-Chapel Hill’s share was $499 million. The Master Plan’s approval by the Board of Trustees in March 2001 provided guidelines for these repairs and renovations alongside extensive campus development. This plan, along with the funding from the bonds, resulted in a construction boom as the university quickly moved forward on putting its plans into motion.

As a result of this construction, spaces in permit lots and sometime entire lots have been taken over by work crews. These spaces are used primarily for staging the construction equipment and contractor and crew parking. The effect has been a significant loss of employee parking. Construction on and around Cobb Lot, for example, has resulted in a loss of 240 parking permits. While these are not permanent losses, the construction work will have temporarily displaced parking for more than two years.

3.3 Structural Issues

Parking permit allocation is a two-step process. The Department of Public Safety issues a number of permits to each department; the departments, in turn, issue them to their employees.

DPS distributes parking permits to departments based on the following formula:

- 80% of the available parking permits are distributed to departments based purely on the department’s percentage of the total university employees;
- 20% are allocated to departments based on their employees’ combined years of state service as a percentage of total state service for all university employees.

Each department decides upon its own formula for distributing its allocated permits to employees. Most departments use total years of state service and/or department service to determine priority for parking permits.

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3.4 Ramifications

Faculty recruitment and retention

Under the current parking permit distribution system, most departments allot their permits based on years of service as described above. New faculty are therefore least likely to be allotted a permit in most departments. Faculty who have been in a department for years may still not have enough seniority to qualify for a permit under the department’s formula. Within the university, a significant problem has been identified whereby the availability of parking is impacting UNC’s ability to recruit and retain faculty.36

Railheading

When people who use the park and ride system find their preferred lot to be full, they face a choice. They may circle the lot waiting for an open space or drive to another P&R lot. They may also decide to park on a private parking lot or unregulated city street near a transit stop. British transport planners have termed this practise of unofficial parking-and-riding ‘railheading’.37 This practise can be bothersome for businesses and local residents who must tolerate the extra vehicles.

3.5 Alternative parking problems

Park & Ride issues

Chapel Hill’s park and ride system currently consists of eight lots: five are UNC lots requiring a free Commuter Alternatives Program (CAP) permit, while the remaining three are free lots operated by the town. A ninth lot is slated to open later in 2006 at the Chapel Hill Bible Chapel just off US 15-501.

While the park and ride system as a whole is currently operating under capacity, certain lots do become full early and remain so for most of the workday. This is more common at the ‘inner ring’ P&R lots, particularly at the Friday Center/NC 54, Southern Village, and Franklin Street sites. While this does not pose a problem for commuters who arrive early, those who arrive later in the morning can spend a significant amount of time trying to find a parking space. Among the groups affected are students with late morning classes, employees who work 9-5, and campus and hospital visitors. These problems can deter people from using the park and ride system and encourage railheading.

The chart in Appendix A shows the major flows into and through the park and ride system and the points at which people are likely to give up on finding an official P&R space.

36 Khattak, Asad. Personal communication. 17 February 2006.
3.6 Night & weekend parking problems

Although most faculty and staff leave campus by 5 pm, many academic and social activities continue on campus after this time. Table 2 lists some of these activities. However, travel modes that suffice during the weekday are often impractical or nonexistent at nights and on weekends. Students who typically walk or bike during the day are often reluctant to do so at night because of heightened personal safety concerns. Reduced off-campus transit service leaves non-residents with few options but to drive in order to participate in on-campus activities. And although most campus permit lots are open to all at nights and on weekends, finding a parking space can still be a significant problem.

Table 2. Common night & weekend activities on campus.

<table>
<thead>
<tr>
<th>Academic</th>
<th>Social</th>
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<tr>
<td>Evening classes (many of which are continuing education courses)</td>
<td>Student organisation meetings</td>
</tr>
<tr>
<td>Group meetings for class projects</td>
<td>Movies at the Student Union</td>
</tr>
<tr>
<td>Study sessions</td>
<td>Concerts</td>
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<tr>
<td>Guest speakers</td>
<td>Plays/theatre productions</td>
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<tr>
<td>Academic enrichment outside of the classroom such as lectures</td>
<td>Attend UNC sports games/matches</td>
</tr>
<tr>
<td>Library-based research</td>
<td>Intramural games/practises</td>
</tr>
<tr>
<td></td>
<td>General ‘hanging out’, e.g. in the Underground</td>
</tr>
<tr>
<td></td>
<td>Lessons in dancing, CPR, etc.</td>
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<tr>
<td></td>
<td>Bible studies</td>
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</tbody>
</table>
4 Methodology

The first task undertaken in order to address this project was to identify framework within which the problem is posed and solutions must be found. This was supplemented by extensive review of the relevant guiding documents (such as the Master Plan) and other literature. Once this was complete and the problem defined, the issue was then considered in detail to identify possible solutions that warranted further investigation.

The next step was to consult with student, staff, and faculty stakeholders to determine the scope and ramifications of the problem. At this time comments about the possible solutions identified above were solicited. Stakeholders were also asked for their suggestions for other possible solutions.

Transportation planners at the two relevant transit agencies were consulted to establish the feasibility of various concepts. The technical aspects of potential solutions were investigated; two particular solutions were analysed in greater depth in separate literature reviews.

Taking into account all of the information as identified above, the proposed solutions were documented in detail, along with benefits and drawbacks. Recommendations were then made about the proposed solutions and conclusions drawn.
5 Literature Review & Discussion

5.1 ATIS (Advanced Traveller Information Systems)

Intelligent transportation systems (ITS) is an umbrella term that refers to a broad range of technologies with integrated communication functions/facilities that can be used for transportation control, electronics, and information. These technologies can range from signal priority for buses to mayday systems that call 911 upon the deployment of an airbag to automated vehicle navigation/collision avoidance.\(^{38}\)

One of the most useful areas of ITS is Advanced Traveller Information Systems (ATIS), a collection of technologies that provide real-time transportation information directly to travellers. A classic example of traveller information is rush-hour traffic reports on commercial radio stations, which allow listeners to avoid heavily congested areas and select alternate routes to their destination. The original intent of ATIS was to provide information about travel from an origin to a destination. However, the applications of these technologies are expanding,\(^{39}\) allowing individuals to make informed selections of routes, modes, and even destinations to help minimise their travel time.

ATIS provides a variety of benefits on multiple levels. First, individual users can use the information to help minimise their own travel time. Second, when individuals reduce the amount of time they spend travelling, the greater system benefits by having less demand placed on it. In many cases, a few problem areas create bottlenecks in the system that cause delays for most travellers. By better distributing the demand, the system’s efficiency improves. Third, ATIS technologies can help improve the efficiency and operations of a system without the need for new or expanded infrastructure.

From a system standpoint, the four basic requirements in order to see a benefit from ATIS are: travellers must own or have information-receiving technologies; they must be aware that travel information is available and useful; they must access or obtain the travel information; and they must use it to change their behaviour.\(^{40}\)

Information-receiving technologies

The potential to receive travel information can come in many forms. Some are vehicle-specific, such as in-dash GPS navigation systems (generally an optional feature on high-end vehicles at present) and car radios. Some are device-specific, such as TomTom, a portable GPS-based navigation device and service that can be used in or out of a

vehicle.41 Others form an alternative use for an existing personal communication device such as a cell phone, personal digital assistant (PDA), or BlackBerry.

GENESIS, an early ATIS test in 1995-96, tested travel information sent to pagers and an early, specialised type of PDA. The independent evaluator concluded that users were more satisfied using the pagers they already had because they could use them for other purposes, including personal messages. The evaluator also found that the device/message needed be easy to read and use, since the information is intended to help drivers who are already en-route and should focus primarily on the task of driving.42

Currently, there are few media that can be considered to have a general penetration in American society. In-dash GPS navigation systems are, at present, an optional feature on new high-end vehicles and are not commonplace. Portable GPS devices are popular mostly among outdoor enthusiasts and are also not common in the general population. The number of people who own devices such as PDAs with wireless internet connectivity, BlackBerrys, or cell phones with GPRS internet connectivity are on the rise, but are at this stage still form a small proportion of the population. Cell phones and AM/FM radio are essentially the only widespread communication devices that the majority of the commuting population can be assumed to have.43

**Awareness of travel information**

Awareness of the availability of travel information seems to vary widely. A 2000 Seattle study of various sources of travel information found that awareness of information availability varied by source and type of information provided. Websites that offered real-time traffic conditions and bus routes/schedules were generally well-known. Travellers were much less familiar with Traffic TV, which also offered real-time traffic conditions on a local cable channel; the vast majority of those who were aware of it had found it while channel surfing.44 However, in the earlier GENESIS study, some recipients of the traffic alerts felt ‘protective’ of the information they received: users were concerned that their alternate routes would get filled up if many others knew about the congested area in advance.45

A further discussion of increasing awareness of information availability through marketing can be found in section 0.

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Access/obtain travel information

Travellers’ interests in travel information are focused primarily on the ease of accessing the information, including the usability of the information system; the accuracy, reliability, and timeliness of the information; and the cost of accessing information, which includes both the price of a device and any service fees.\(^{46}\)

The Seattle study found that individuals found the website with real-time travel conditions, including traffic camera views, to be highly useful and used them frequently. This site was felt to be accurate and timely. The transit authority’s website, which offers transit routes and schedules, was also heavily used, but many respondents felt it could be made more useable for new visitors to the site.\(^{47}\) This illustrates the importance of a website’s visual and logical design for making travel information clear and easy to find.

The cost of accessing travel information is a potential deterrent. Several early studies in the mid- to late-1990s, mostly using specialised devices such as watches with text-receiving capabilities, in-car navigation systems, and ad hoc PDAs, indicated that many users would be willing to pay $5-10 per month for a traffic information service.\(^{48, 49}\)

However, several factors probably negate those studies’ transferability to the current context of park & ride lots at UNC. First, in many places travellers can now get accurate and timely information about their route before they leave home. Access to the internet has grown tremendously since the 1990s: as of February 2006, 74% of US households have internet access at home. 68% of those households, or just over half of all households in America, have a broadband connection.\(^{50}\) These travellers can easily check a website and see real-time traffic cameras showing current road conditions. Because the cost of a computer and internet service are sunk and set costs, respectively, internet users generally perceive access to a website as being free (unless a site has a specific charge for content). Thus most travellers would probably be unwilling to pay for pre-trip information. This is especially true if the information source is a governmental agency.

Second, the technologies used in those studies are largely obsolete. Cell phones with increasingly diverse functions have replaced pagers as the personal communication

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device of choice: 70% of Americans now have a cell phone. Rather than being the primary function of a device, traffic reports would likely be viewed as an add-on feature. Most travellers would probably not be willing to pay more than a few dollars for a traffic service, and especially not for basic information about a destination.

Whether and how much individuals might be willing to pay to receive information about the destination while en route is a different issue that is beyond the scope of this paper. However, it is reasonable to assume that travellers coming to a Chapel Hill park & ride facility might be willing to pay a nominal charge to find out about the capacity of the P&R lots. This nominal charge could be a 1-2 minute phone call, their cellular service provider’s fee (usually $0.10 per message) to receive a text message, or the fee to send/receive a small amount of GPRS data.

A further discussion of increasing access through marketing can be found in section 5.2.

**Use information to change traveller behaviour**

Many researchers have shown that travellers seek to avoid congestion and travel delays and, if given pertinent travel information, will make alternate route choices. However, there is little research available on the effects of destination information on en-route decision-making. The most relevant research thus far is a test of ATIS on parking at Acadia National Park in 2002. This operational test used message boards to inform park visitors and those staying at nearby campgrounds of real-time parking conditions at two popular park destinations. These two destinations’ parking lots typically suffered significant overflows, while parking lots at sites elsewhere in the park operated under capacity. When the message boards were in operation, those two parking lots were found to have less overflow; the other parking lots had increased levels of parking. This supports Acadia’s hypothesis that the traveller information helped distribute the number of cars more evenly among the available parking lots. In addition, the park reported both an increase in visitor numbers and an increase in the use of its bus service, suggesting that the parking information – in combination with information about the bus service – likely caused some visitors to change their intended mode from car to bus.

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5.2 Social & Individualised Marketing

Social marketing

Social marketing is an approach towards behaviour adoption or modification in a target group that adapts commercial marketing techniques to influence individuals’ behaviour for individual or societal benefit. Social marketing, in effect, ‘sells’ a new or different behaviour rather than a particular product.\textsuperscript{53, 54} The key element of social marketing requires actively listening to the target group and finding out from them what barriers they face with respect to adopting the desired behaviour.\textsuperscript{55}

From the marketing side, a campaign must develop an integrated strategy that focuses on the 4 Ps:

- **Product**: the desired behaviour, benefits of the behaviour, and any tangible objects or services that support the desired behaviour
- **Price**: monetary cost of adopting the behaviour (usually related to tangible objects or services) plus nonmonetary costs, such as physical discomfort or time and effort spent in performing the behaviour
- **Promotion**: the channel by which the message is broadcast to the target group
- **Place**: where and when the target behaviour is/will be performed; this informs where and when the message should be broadcast.\textsuperscript{56, 57}

On the social side, social marketing campaigns must consider other elements; most of these should be familiar to non-profit organisations. These include:

- identifying secondary audiences and their potential influence on the primary audience
- getting staff buy-in on the campaign
- potential partnerships with other organisations that might share the same mission
- identifying policies that can affect adoption of the behaviour, both positively and negatively
- identifying and/or raising money to fund the campaign.\textsuperscript{58}

A holistic social marketing campaign could potentially involve numerous different groups and organisations. Social marketing stresses that if structural or institutional issues form a significant barrier to the desired behaviour, these issues should be resolved.


For example, if an effort to increase bicycling activity finds that few people bicycle because there are no cycle lanes in that town, the organisation should work with municipal employees to try and overcome these barriers.

**Individualised Marketing**

Individualised marketing (IM; also called personalised marketing) is a recent subset of social marketing. It uses similar principles, particularly the focus on target groups’ self-identified barriers to behaviour change. However, rather than using that information to develop a broader, one-size-fits-all campaign that focuses on the target group as a whole, individualised marketing keeps the issue on a personal level. Instead of marketing at the target group, individualised marketers allow interested parties to open up an ongoing dialogue about their personal barriers. If the first barrier to an individual’s public transit use is awareness, campaigners can break through that by simply having the discussion. If a second barrier is lack of relevant information, campaigners could provide the individual with a bus schedule for the route nearest their home and the URL of an online journey planner. As long as an individual is interested, individualised marketers should take whatever steps are necessary (within reason) to make the individual comfortable with the new behaviour.

In addition, the premise of individualised marketing differs from that of social marketing. IM is based on the fact that traditional travel modelling assumes rational behaviour and perfect information, yet individuals’ awareness of their alternative transportation options and perception of their opportunities are usually significantly worse than they really are. IM thus seeks to bridge the gap between perception and reality.

At this time, individualised marketing is still an early technique for eliciting behavioural change. The concept was developed by Werner Brög, founder of a transportation research consultancy called Socialdata. Socialdata’s trademarked process has been used in various cities around the world, including Perth, Portland, Seattle, and many in Germany, Austria, the UK, and Australia.

There is limited research on the marketing methodology itself and very little legitimate statistical analysis of which personal, location, or household characteristics best lend themselves to successful individualised marketing. Some concerns have been raised about Socialdata’s methodology, specifically relating to whether the experimental population can be considered genuinely neutral if many people in this self-selected group

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63 Khattak, Asad. Personal communication with Werner Brög. 28 March 2006.
exhibit a strong existing positive attitude towards alternative transportation. However, publications from various government and independent assessments have agreed that the Socialdata’s particular type of individualised marketing have shown significant improvements in the take-up of the desired behaviour changes in the cities where their marketing campaign was applied.⁶⁴

The Federal Transit Administration recently completed a four-city demonstration study of Socialdata individualised marketing that included Durham. The study was designed to use IM to increase the use of environmentally friendly travel options, particularly walking, bicycling, public transit, and carpooling. Briefly, the results showed increases in both the number of trips made using environmentally friendly modes and the share of these modes as a percent of all trips. There was a 7% reduction in the number of people driving cars and an 11% decrease in the number of miles driven.⁶⁶ Again, although concerns about the methodology may be valid, it is safe to conclude that the desired effect – to increase the use of environmentally friendly travel options – was achieved.

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6 Proposed Solutions

Carolina already employs virtually all campus parking management practices that are out there. With parking constraints in every direction on main campus, any changes that can be made to on-campus parking will produce relatively minor effects. The park and ride lots, however, are a different situation. Location, size, accessibility, cost, and frequency of transit service can have a significant effect on how popular a P&R lot is. These factors can be much more easily controlled and manipulated to improve the attractiveness of the park and ride option relative to parking on campus.

6.1 Improving information & distribution

Park & Ride availability information system

Overview

An advanced traveler information system could be implemented for the park and ride lots in Chapel Hill. This would provide real-time details about the availability of parking spaces in each of the P&R lots through a variety of media.

The information provided through this system is likely to be most useful on corridors where there is both an ‘inner-ring’ and ‘outer-ring’ park and ride lot. For example, a commuter coming from Pittsboro on 15-501 is likely to prefer parking at Southern Village, since that facility is served by two buses that run more frequently than at the Chatham P&R lot. If he drives as far north as Southern Village, only to find that there are no spaces, he is left with several choices: drive to the Jones Ferry or Carrboro Express lots, pay for parking on or near campus, or turn back and park at the Chatham lot. In any case, he pays a penalty in lost time and extra gasoline; if he parks in town, he will also be paying an additional fee. If, however, he knew that the Southern Village lot was full before he reached the Chatham lot, he could park there and save himself time, money, and frustration.

How it could work

Initially, devices would need to be installed in each lot that could determine the number of available spaces. This might be achieved by using induction loops to count the number of cars entering and exiting, having optical tracking devices to follow each vehicle, or putting a sensor in each space. A simple counting system at each entrance/exit would probably be sufficient, so long as it keeps an accurate count.

The devices at each lot would transmit the number of available spaces to a central database. Transmission of the data could be done in a number of ways; the technical aspects would best be determined by site characteristics. The database would hold both...

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current and historical data, which would be useful to transportation planners as well as commuters.

**Dissemination methods**

The information about parking space availability could be disseminated in a number of ways. A parking information website could provide real-time numbers, which would be useful for commuters coming from nearby areas. As discussed in the literature review, this type of real-time information website is popular with commuters. Although previous studies have not investigated the effects of destination information on commuters’ choice of destination, it is reasonable to believe that commuters will respond positively and use the information to adjust their park and ride destination as needed.

In order to make the most effective decisions about which P&R site to use, commuters generally need information early enough to change routes before they enter Chapel Hill. A commuter travelling from Raleigh on I-40 would probably prefer to park at the Friday Center or NC 54 lot, since they are the closest P&R sites on her journey. However, if she knew that both were full (and, ideally, that several people were already circling each lot waiting for a space to become available) before she took the NC 54 exit from the interstate, she might choose to stay on I-40 and use the Chapel Hill Bible Chapel or Eubanks Road lot instead if either had available spaces.

Three information sources could provide her with this information while she is en route. First, she could call an automated hotline from her cell phone that would read aloud the most current parking availability numbers. At a minute or two maximum for the call, she would likely view this as a free method of obtaining the information if the call only counted against minutes included in her cell phone plan.

Second, she could arrange to receive a text message from the real-time information website. At present, this method would likely incur a $0.10 delivery fee per message from her wireless service provider, but she may find the service useful enough to be worth the cost. She could also modify the notification settings on the website to send messages only on certain days, at certain times, or under certain conditions (such as her preferred lot being full at her usual commute time); this customisation to her needs could save her money and still allow her to get the information she wants.

Third, she could tune her car radio to a traffic information radio broadcast as she approaches Chapel Hill. These would be low-power AM or FM transmissions68, which would simply list the availability numbers for each park and ride on a repeating loop.

**Benefits**

This system is intended to more evenly distribute the users of the park and ride system among the available lots. By having early information about a preferred lot, potentially while en route, a user could more easily divert to a different lot if needed. Since the park and ride lots are fairly distant from each other, having this information at an early enough

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stage allows commuters to make an effective choice of routes. This helps minimise the
time spent travelling to and circling a lot that is full. At present, this information service
would be primarily relevant for the most popular park and ride lots. However, as the
university continues to grow and more demand is placed on the park and ride system, this
service would be increasingly useful for commuters at all sites.

Costs
Setup costs are likely to be high. Without doing a full specification and design, these
costs cannot be accurately estimated, but are likely to be in the region of tens of
thousands of dollars. Major capital costs are expected to be the vehicle counting devices
and their connection to the central database, the audio annunciator system used to ‘read’
the data on the hotline and radio broadcast, and any setup costs for the radio transmitter.

However, some of these costs could be minimised by taking advantage of institutional
arrangements that could be made through the university. For example, UNC could set up
the phone line for a minimal monthly cost. If appropriate technical expertise is available
in-house, such as through the Computer Science department, it could significantly
decrease the setup costs to design the database and website/text messaging system.
Chapel Hill already has a radio station, 1630 AM, which broadcasts traffic information
during special events. This could be co-opted for the park & ride availability information
system at other times.

Promoting the system
Advertising on the buses is a natural medium to reach the current commuter population.
It also reaches railheaders, since they use the bus system as well. The system could also
be promoted as part of a wider effort to publicise the Commuter Alternatives Program.

Apply individualised marketing techniques
Socialdata’s success in individualised marketing comes in part from their approach of not
‘pushing’ anything but instead offering information to empower people to make their
own decisions. By asking individuals if they are interested in the information and
offering the opportunity to indicate what information they would find useful, the
marketing effort can focus on those most likely to change their behaviours. While this
approach may not reach everyone who might change, it should give the best returns for
the marketing monies spent due to the self-selecting nature. Future marketing campaigns
could then focus on reaching those who were initially reluctant to express interest.

Elements that Socialdata have found to be most effective include69:
- Helping them get the information they want, for example, how to tune up their
  bike or where to go to get it done.
- Allowing people to try new modes at low risk. An example would be offering
  free bus passes for a month.

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69 Brög, Werner. “Individualized Marketing Pilot Project Results.” Presented 28 March 2006, Chapel Hill,
NC.
An individualised marketing campaign at UNC to promote alternative transportation modes could be modelled after the Socialdata demonstration in Durham. The target population would be UNC staff, faculty, and off-campus students. This population would be split into two groups, treating Chapel Hill/Carrboro residents separately to the others. The non-Chapel Hill/Carrboro residents would be offered information on the Commuter Alternatives Program, park and ride facilities, Chapel Hill Transit, and relevant TTA services. Chapel Hill and Carrboro residents would additionally be offered information on bicycling and walking.

Under CAP rules, on-campus permit holders can already ‘try’ the program out for a few days without giving up their campus permit. Publicising this through the individualised marketing campaign to those who have on-campus permits would provide the risk-free trial which has proved successful in Socialdata trials.

**Promote the Commuter Alternatives Program**

During conversations with students, staff, and faculty members, it was clear that many potential CAP members are unaware of the program’s existence. Others did not know key details, such as that the program is free or that the CAP permit allows parking in five P&R lots. This leads to the conclusion that more publicity for the program could reach potential users who have not considered the alternatives to parking on campus.

Ways that this could be promoted include:

- Employees who have campus permits must fill out paperwork to renew them each year. A flyer detailing the benefits of CAP could be inserted in the mailing with the renewal paperwork. This flyer could include information about the cost savings that would be achieved if this individual gave up their on-campus permit as well as detailed information about travel alternatives such as public transit (CHT and TTA) and the CAP park and ride lots.
- Posting large, colourful notices on departmental notice boards.
- Reaching staff and faculty through the University Gazette. This could take the form of an advertisement or an in-depth article on the Commuter Alternatives Program.
- A guerrilla marketing campaign could engage enthusiastic volunteers (such as from various campus environmental groups like SEAC) to knock on office doors when they see the light on and politely engage them in a conversation about CAP.

### 6.2 Reducing Demand

N.B. Many of these proposed strategies actually invite creative interdisciplinary collaboration with students and faculty, not just in stakeholder consultation but in planning and preparation. This can help ease the workload on full-time staff and provide students with real-world problem-solving experience. Some ways in which this interdisciplinary collaboration could take place include:

- Business school students, under the care of a professor interested in social marketing or transit issues, could receive academic credit for working as a team to

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create an effective social marketing campaign. This could be offered as a one-module elective and might be particularly attractive to students specialising in marketing or non-profit organisations.

- Public health graduate students, especially those interested in active living by design, might also be interested in working on a social marketing campaign, perhaps in collaboration with the business school.
- Geography graduate students could determine the most appropriate areas in terms of geography and distance for encouraging biking, walking, transit (CHT and TTA), and P&R and corroborate this information with geocoded student & employee home addresses.
- UNC’s Department of City & Regional Planning offers several workshop classes that work with real-world clients. The biennial Pedestrian/Bicycling workshop could help design and select appropriate locations for bike routes and determine where and what improvements should be made to walking facilities; annual transportation workshops could focus on developing or analysing many different strategic solutions.

Social marketing to students, staff. Be specific: target biking to CH and Carrboro, esp. where it’s flat; target TTA to Durham, Hillsboro, & Raleigh (plus towns surrounding Raleigh); target CHT to staff & faculty in CH and Carrboro. CHT especially full on some routes/times; target TTA to new riders in those areas? Esp. if fare free?

**Improve transit service**

A key aspect in encouraging commuters to not drive to campus is to ensure that the transit service provides for their needs. Certain improvements to existing services could help, some of which would have a minimal cost to the transit agency.

**Chapel Hill Transit**

Currently, numerous large residential clusters, including Finley Forest, and the ‘walkable communities’ of Meadowmont and Southern Village, are poorly served late at night and on weekends. The FG route, which runs during the day on Saturdays, could easily be rerouted to also serve Meadowmont. Additionally, extending the service hours for this route would allow it to narrow the service gap until the start of the Safe Ride G for this area. Similar changes could be made to the JN route to serve Southern Village and narrow the service gap with the Safe Ride J.

The Safe Ride program suffers from a lack of information about service provision. The information currently available does not indicate what dates the service runs, merely saying “service is provided on most Thursday, Friday & Saturday nights,” 71 making it difficult to plan an evening around use of the service. Further, though the service is operated as a joint venture between Chapel Hill Transit and UNC’s DPS, neither agency seems to be able to provide information about whether the service will run on a particular day. Safe Ride routes, because they run late at night on weekends, have the potential to

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reduce drunk driving in Chapel Hill. These should be widely advertised, including on regular bus routes in the area and possibly in local night spots.

**Triangle Transit Authority**

The timings of certain TTA routes do not appear to fit well with the work schedule of potential users. TTA should consider changing timings on the following routes.

- The university lists 346 staff members who live in Hillsborough. Many of these are likely to have 7:30am-3:30pm work schedules, such as housekeepers and administrative assistants. The first bus from Hillsborough arrives at Franklin Street 45 minutes before their work starts; the next bus arrives too late. Similarly, in the afternoon, the 3:20pm bus from downtown Chapel Hill is just a bit too early for most of these workers, and the next does not arrive for more than an hour. This schedule introduces considerable wasted time into employees’ workdays, which serves to discourage potential riders.

- The Raleigh to Chapel Hill express route has an identical problem. There are 280 staff who live in Raleigh, plus an additional 181 who live in nearby towns (Apex, Fuquay, Garner, Holly Springs) convenient to the TTA park & ride lot on this route.

**Improve bicycling facilities**

Bicycle facility improvements should address two elements in order to encourage more use of this mode. Travel facilities, such as bike lanes, wider shoulders, off-road bike paths, and the like, help make the journey safer and more pleasant. Storage facilities on campus should be convenient and secure. This could take the form of bike lockers or trees, which provide dry, secure storage. Bike shelters could be added in areas with existing bike parking, which would protect parked bikes from the elements.

One of the more interesting results of the 2002 campus commuting study found that 70% of people who commuted by bicycle to campus had a yearly income over $50,000. (This makes more sense when one considers the average housing prices within reasonable bicycling distance to campus.) These users are likely to be concerned about the security and protection of their bicycles while parked.

**Improve walking facilities**

The university’s site at the top of a large hill will deter some would-be pedestrians simply because of the terrain, but there are several flatter pedestrian corridors that could benefit from an improvement in walking facilities. The town should investigate making repairs and improvements to major pedestrian corridors, including Cameron Avenue towards Carrboro, East Franklin Street outside of downtown, McCauley Street, West Franklin

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Street from Carrboro, North Columbia Street north of Historic Airport Road, South Columbia Street between Purefoy Road and Manning Drive, Rosemary Street in downtown, and Hillsborough Street.

Some specific aspects of walking conditions to consider:
- Lighting
- Physical sidewalk conditions: sidewalk continuity, broken or uneven pavement, permanent obstructions, etc.
- Pleasantness: landscaping,
- Safety: ability to see oncoming and turning vehicles,

N. B. This is a good opportunity for the town to consider ADA requirements and make accessibility improvements at the same time.

**Improve the CAP program**
Along with increasing awareness of the CAP program, there are several changes that could be made to make it more attractive to faculty with on-campus permits. The CAP program is currently divided into students and employees. One idea is to further subdivide the program, splitting the employee category into staff and faculty. Faculty could then be offered an even stronger incentive to give up their campus permits and become CAP participants. Suggestions for enticing faculty could include:
- When the new park and ride lot opens at the Chapel Hill Bible Chapel, turn the Franklin Street CAP lot into a faculty-only P&R lot. This lot has the advantage of being the only CAP lot within walking distance of main campus.
- Employee CAP members are currently entitled to use one 1-day parking pass in the S-11 lot each month. This could be enhanced for faculty CAP members by allowing them to have such passes on a north campus lot instead of S-11, which would be vastly more useful. (From a technical standpoint, the 1-day passes might need to be restricted to being used in the largest north campus parking areas, such as S4 and the deck being constructed on the site of the former N4 lot behind Cobb Dorm, so that this additional demand can be more easily absorbed. The 1-day passes might also be valid for use in a visitor lot.)
- Pay the initial $20 Zipcar membership charge for any faculty who give up their on-campus permit for a CAP permit or bus pass.

**Raise permit prices**
Another option for decreasing demand for on-campus parking is to raise prices across the board for permits. Concerns about equity issues are already addressed by the fee structure, which is banded based on income. While raising parking prices is never a popular option, it could be used as part of an integrated campaign to promote the CAP program and alternative travel modes to campus.
6.3 Increasing Supply

On-campus parking

Selectively increase parking permits issued
Parking control officers already have a good working knowledge of which lots are constantly full and which usually have some availability. UNC’s Department of Public Safety can take advantage of this knowledge and the nature of the officers’ jobs to gather data on which parking lots have open spaces and when. The information collected should include the date, time, and number of open spaces, including disability spaces. DPS may also be interested in other factors that might potentially affect parking lot usage such as weather. The data should be collected over the course of several weeks or a month; the effort should take place during normal operations (e.g. in the middle of a semester, rather than during university holidays, exams, or summer sessions).

These observations can provide the basis for Parking Services to fine-tune their operations and regulations so that existing campus parking can be used more efficiently. Some possible changes that can be made to accommodate a few more campus commuters include:

- Sell more permits in lots that have open spaces all day. The Morehead Planetarium permit lot, for example, nearly always has a few parking spaces open throughout the day.  
- For lots that are considerably emptier in the morning or afternoon, consider offering AM or PM permits. This can be especially useful for faculty who only teach in the morning or afternoon and do not stay on campus all day.
- If the University provides more disability spaces than required under ADA regulations, DPS should consider converting some disability spaces to regular permits. However, this should only be considered if evidence shows that there are always unused disability spaces in a lot. It is important for physical and social accessibility that the University does not move or change disability parking spaces if they are actually used.
- Also, if permitted by ADA rules, consider changing some 24-hour disability spots to 7:30am-5:00pm. Few of the 24-hour disability spaces appear to be used at night and could provide more night and weekend parking. Again, this should only be considered if there are always unused disability spaces in a lot.

Night and weekend parking
As discussed earlier, construction work occupies a number of parking lots and spaces around campus. While some of this is used for staging construction equipment, much of it is used only during the day for parking related to the construction; these lots sit empty outside of the workday. However, it is unclear from the current signage whether parking is permitted outside of these hours. While the construction continues, the night and weekend parking situation could be markedly improved by clarifying the signs on these lots to allow out-of-hours parking.

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75 Khattak, Asad. Personal communication. 17 February 2006.
Vehicle stacking

Vehicle stacking, also known as car stacking, is a mechanical parking solution that enables multiple vehicles to be parked in the footprint of a single vehicle. This presents a potential method for increasing the number of on-campus parking spaces. In the context of the historical nature of the UNC campus, this type of technology is only suitable for use in parking decks. Future parking structures could be designed to accommodate vehicle stackers; however, this type of technology requires a trained operator and thus is only suitable for valet parking. These devices are also unsuitable for many types of vehicles, including vans and trucks. Stackers require significant capital outlay per space, plus additional electricity requirements for each stacking mechanism. At the current time, these drawbacks mean that vehicle stacking is unlikely to be a practical solution for the UNC campus.

Park and ride lots

Chapel Hill’s desirability and relatively small size have pushed land values in town to some of the highest in the state. In much of Chapel Hill, the existing land uses have been there for many years. This makes finding locations for new parking lots difficult and expensive. Rather than trying to find new sites for permanent P&R lots (except for the 15-501 corridor from Durham, which certainly needs its own lot), two strategies for increasing the supply of park and ride spaces seem prudent.

Shared parking

Shared parking operates on the principle that different land uses may have different peak periods of parking use. A single parking lot shared between compatible land uses reduces the total amount of land needed for parking. Weekday daytime parking requirements, which are most needed at UNC, mesh well with land uses that have evening and weekend peaks. These include restaurants, bars, theatres, religious institutions, parks, shops, and malls.

UNC has already implemented at least one instance of shared parking at the Franklin Street CAP lot. That parking area, on the corner of Franklin and Elizabeth Streets, is owned by the Masonic Lodge. Since the Lodge only meets on evenings and weekends, they have graciously allowed UNC to use their 69-space parking lot during weekdays from 7:30am to 6pm. Starting in fall 2006, the university will share the Chapel Hill Bible Church’s extensive parking lot as a weekday P&R lot. This should help ease the overflow at the Friday Center and NC 54 lots, since a significant number of people who park at those two lots come from the 15-501 corridor.

Working out agreements with land uses that have existing parking lots, in the same spirit as the Masonic Lodge, could provide more CAP lots for UNC. However, it is important to find locations that are well-served by transit; bus routes and schedules may need to be adjusted to accommodate these CAP participants’ schedules. Possible sites for further investigation of shared parking include, but are not limited to:

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• United Church of Chapel Hill\textsuperscript{77} on Historic Airport Road (NC 86), which is served by the A, NS, and T bus routes;
• Aurora Restaurant\textsuperscript{78} on Raleigh Road (NC 54), which is served during the day by the S and V routes and additionally by the FCX and HU routes after 7:00pm. This property has been purchased by the University, which may affect whether shared parking is possible;
• University Mall on S. Estes Drive, which is served by the G, F, and M Shuttle routes. This site serves the US 15-501 corridor and should be able to support the extra traffic, especially in the early morning. The parking area near the corner of S. Estes and Willow Drive outside Dillard’s department store is rarely used. The F does not currently stop at the University Mall bus stop until 8:18am, but this should be re-evaluated if this area becomes shared parking.

Parking structures
The measures outlined above are designed to reduce demand, share parking supply more efficiently, better manage existing parking supply, and more closely align the distribution of demand with the supply. It is hoped that these will be able to produce sufficient benefits to prevent a need to build more park and ride spaces in the next few years. However, with student enrollment continuing to rise, corresponding increases in staff and faculty hiring, and fewer than expected spaces being built on campus, it appears inevitable that more park and ride spaces will be needed in the future.

Given this inevitability, UNC may prefer to build up instead of out. Rather than building new surface lots, for which a plot of land must be found and purchased, some existing P&R lots could have could have parking structures built over the surface to increase capacity. The Friday Center lot, among others, is a good candidate for this since it is on a flat, open site. Overground parking structures are more expensive than surface parking, since they require much more engineering and materials, but the cost can be viewed as mitigating the need for additional on-campus parking.

7 Recommendations & Conclusions

7.1 Recommendations

The last section detailed a number of solutions which could help ease the parking situation on campus. A number of the solutions are low-cost or free, such as improving information dissemination about existing programs and facilities, more efficient managing of existing parking, and adjusting bus routes and schedules. There is little reason not to recommend the implementation of these solutions.

Certain solutions carry a much higher up-front cost. Their implementation is also recommended, though a detailed cost-benefit analysis would have to be done to ensure that these would represent good value for money to the university. This analysis may show that a given solution is not worth implementing at this time but would become worthwhile in the future as campus parking problems continue to worsen, such as may be the case with the park and ride availability information system.

Implementing the individualised marketing campaign in the near future, while somewhat costly, could provide significant benefits in the short term. This may potentially mitigate some of the on-campus and park and ride problems before they occur.

7.2 Conclusions & Further Work

The addition of a park & ride at the Chapel Hill Bible Chapel should certainly improve the P&R situation. However, as we look into the future with a continually increasing number of students, staff, and faculty, and as we reduce parking, we must find a way to improve the alternatives. While several of the current P&R lots (Eubanks Road, Chatham, etc.) do not fill up now, they probably will in the future. It seems inevitable that at some point more park and ride locations must be found and built. In the meantime, simply doing a better job of managing the ones we have now will probably suffice for a number of years.

A future social marketing campaign could proactively target different modes and travel options to various people based on student/staff/faculty status. Student and employee home addresses could be geocoded into a GIS file with topology (for biking), CHT bus route, and TTA bus route layers. These could then be used to target individuals with information that they would be most likely to benefit from.

Integrated corridor management (ICM) presents an interesting proposal for managing Chapel Hill’s rush hour traffic.79 This high-tech approach ties together operational, institutional, and technical integration.80 Although ICM is in early stages of research, a grant proposal for initial field operation tests (due 15 May 2006) is available at

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Federal funding to study the situation and ICM’s feasibility might be desirable for Chapel Hill.
Flowchart of campus commuters' decision-making when selecting a park and ride facility.