

Campus Development, Parking, and Transit Trade-Offs

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A campus transportation plan is becoming more important as campuses continue to expand. The planning process provides for an orderly method of analyzing various alternatives for solving the parking and transportation problem. One of the steps in the planning process is to develop transportation alternatives. One alternative to be considered is an increase in the number of parking spaces on the campus. This can be accomplished in a number of ways. Determining the best solution to this alternative requires a detailed revenue and cost analysis that includes capital as well as operating expenses for each possible solution. In addition, revenue forecasts must be made and compared with costs in order to determine the solution that is most feasible financially.

Many colleges and universities have experienced a tremendous period of growth during the past 20 years. During this time many new buildings have been added to accommodate large increases in staff and students. At some universities this growth has been accomplished by constructing new buildings on existing open spaces, usually parking lots; on other campuses the growth has occurred through the acquisition of additional land or the development of satellite campuses. This rapid expansion has generally placed a burden on the campus transportation system and especially the parking operation.

In order to better handle campus development, a campus plan is desirable. This document can take the form of a complete campus development or master plan, including such items as academic programs, facilities, transportation, housing, utilities, and open space, or it can be a transportation plan. The transportation plan can provide more detail than a master plan on transportation services and how they interact with the other aspects of campus development.

DETERMINING WHEN A PLAN IS NEEDED

Before a plan is prepared, it is necessary to determine whether or not there is need for a plan. For campuses that are experiencing significant growth, a plan is a necessity. At some colleges and universities a transportation plan is prepared as the result of an existing circulation, parking, or transit problem. At other schools a higher authority, such as a state legislature or a board of regents, may require that a plan be prepared as a means of justifying budget requests for parking and transportation facilities.

Developing a plan can also provide a way to improve the "town-gown" relationship. This can be accomplished by seeking input from representatives of local government agencies and interested citizen groups. Of course, the campus community should also be involved in the planning process.

PLANNING PROCESS

The planning process to develop a campus transportation plan contains seven major steps:

1. Define the study area;
2. Develop background information on campus growth, policies, regulations, town-gown relations, and so on;
3. Gather necessary data on parking, transit, and other transportation modes used on the campus;
4. Estimate transportation needs by mode;
5. Develop transportation alternatives;
6. Evaluate the alternatives; and
7. Recommend the best alternative.

DEVELOPMENT OF ALTERNATIVES

The development of alternatives must be carefully structured. A broad range of options should be included even if some are likely to be rejected in evaluation. For example, to reduce the need for additional parking or transit service it may be advantageous to limit campus growth. Usually, however, it is unlikely that this can be done and other possible alternatives must be examined.

Assuming that new buildings will be added to the campus and that parking lots are the usual sites for these buildings, alternatives must be developed to handle the transportation needs of a larger number of persons in an area where less land will be devoted to surface parking lots. Possible solutions to the problem of campus growth include the following:

1. Parking structures can either be built as free-standing ramps or included in a new building as a garage. Universities that have constructed free-standing ramps include the University of California at Los Angeles, the University of Michigan, Ohio State University, the University of Minnesota, and the University of Iowa. Parking garages have been incorporated in buildings at the University of Wisconsin at Madison and the University of Pittsburgh.

2. Remote parking lots can be developed and transit vehicles used to transport passengers to and from the campus. Park-and-ride facilities are in use at the Milwaukee and Madison campuses of the University of Wisconsin and at Indiana University in Bloomington.

3. Incentives, such as subsidized transit passes, can be used to increase transit use among faculty, staff, and students. The University of Wisconsin at Milwaukee subsidizes transit passes for students who ride to classes on the Milwaukee County Transit System.

4. Other modes, such as bicycles, mopeds, motorcycles, and ridesharing, can be promoted. The University of Wisconsin at Madison has installed bicycle parking racks that can accommodate more than 9,000 bicycles and has created convenient motorcycle parking spaces in areas within automobile parking lots that cannot be used by automobiles.

5. Satellite campuses can be added and connected by bus service. An example of this is the development of a medical complex in another part of the city or at some distance from the main campus. Bus service is available at the University of Minnesota for persons who must travel between the main campus, the west bank campus, and the St. Paul campus. The University of West Virginia uses an automated people-mover system to connect its campuses to each other and with the Morgantown CBD.

A trade-off between a parking alternative and a transit alternative may involve analyzing the advantages and disadvantages of building a parking structure versus building a remote surface lot and providing a frequent shuttle bus service between the lot and the campus. However, many campus parking and transit operations are self-supporting. Thus, the most important factor that must be analyzed is the financial impact of each alternative on the campus transportation system.

Parking structures require a high capital investment, which is generally financed through a bond

issue. This results in a relatively high annual debt service expense. In addition, unit maintenance and operating costs are generally much higher in a structure than in a surface lot. As a result, revenue requirements per space tend to be very high. Thus, a ramp should be considered in locations where land is scarce and where parking rates can be set high enough to generate the necessary revenue to cover the high fixed and variable costs of the facility. If enough revenue cannot be generated by parkers who use the structure, additional money from profitable surface lots or other sources may be required to pay for the structure.

A remote surface lot can be constructed at low cost and will cost much less to operate and maintain than a structure. In addition, if land must be acquired the cost per square foot will generally be much lower than for a site located close to the campus. Thus, annual costs per space will be considerably lower than in a parking structure.

Transit costs, however, can be costly because bus operations are quite labor-intensive. The amount of transit service required depends on the capacity of the facility as well as the arrival and departure times of the users. Peak-period user requirements are the major determinant of the amount of transit equipment and the frequency of service needed. A minimum service should have buses available for all class periods as well as for major shift changes for staff personnel. For a park-and-ride operation to be successful, its cost to the user must be less than that of more conveniently located parking. This is because of the additional time it takes for the user of a park-and-ride lot to complete the trip to his or her class or workplace. Without some type of incentive most people will not use a park-and-ride facility unless it is the only parking facility available.

Transit service for park-and-ride facilities can be provided by many types of operators and carriers. Although some variation exists in the unit cost of bus service, it should be noted that labor is the major expense and that an operator is required for all transit vehicles. The university can purchase its own equipment and operate the system itself or it can contract with others to perform this work. School bus operators, municipal transit authorities, charter services, and intercity carriers can manage, operate, and maintain the equipment used for the campus service. Another form of operation that is available involves purchasing or leasing the rolling stock and having a professional management firm handle the operation. Because each method has its advantages and disadvantages, the university should thoroughly evaluate its options before implementing a park-and-ride system.

To make an adequate financial comparison between a parking structure and a park-and-ride operation, it is necessary to include both fixed capital costs and variable operating costs. Table 1 provides a unit cost comparison between a conveniently located parking garage and a remote surface lot with transit service to the campus. The table uses data from a study done for a large urban area parking and transit authority. The following additional information was used to develop the table:

1. The construction of a surface parking lot is estimated to range from \$3 to \$5/ft².
2. The estimated construction cost of a parking garage is expected to approximate \$5/ft² for the ground level and \$20/ft² for the elevated levels.
3. The surface-lot area per parking space will range from 250 to 270/ft²/space, depending on the size and shape of the site.
4. The area per space in garages will range from 280 to 310 ft².

Table 1. Comparison of costs for remote surface lot and five-level parking garage.

Item	Remote Surface Lot	Five-Level Garage
Land cost (\$/ft ²)	3	24
Site and construction cost (\$/space)	1,820	6,496
Level of debt payment ^a (\$/space)	260	928
Parking maintenance and operations (\$/space)	150	225
Annual cost (\$/space)	410	1,153
Daily cost, parking ^b (\$/car)	1.61	4.52
Daily cost, transit service	1.26	-
Total daily cost (\$/car)	2.87	4.52

^aThirty years at 14 percent.

^bAnnual cost ÷ 255.

5. Maintenance and operating costs for surface lots will be approximately \$150/space/year.

6. Maintenance and operating costs for parking garages will be approximately \$225/space/year.

7. A capacity of 1,000 vehicles for both parking facilities is used for this comparison.

8. In addition to the costs of site acquisition and parking facility construction, it is necessary to consider the cost of a transit shuttle for the remote surface lot located too far from the campus for students and employees to walk back and forth. It is estimated that the remote parking facility can be served at a transit cost (operating cost only) of approximately \$1.26/car, assuming an average occupancy of 1.3 persons/car and assuming a 1.3 load factor on the bus (these costs are predicated on an hourly bus cost of \$27).

9. It is assumed that no street improvements are required for the construction of either the parking garage or the surface lot. If additional traffic capacity is needed, this cost must be included in the site and construction cost segment of the project.

In this example, the daily cost for a park-and-ride operation is \$2.87/vehicle, whereas a five-level parking garage costs \$4.52/vehicle. Although the five-level garage requires only 20 percent of the land area needed to construct the surface lot, it should be noted that the land is eight times as expensive at the garage site. Because universities are tax-exempt, land costs are not usually considered in this type of analysis. As a result, the parking garage, which is located on more expensive land, will appear to be more financially justifiable. However, an unbiased evaluation of the two alternatives will consider the value of the land in the analysis. Thus, the difference in daily unit costs will be narrowed and possibly eliminated. Surface-lot construction costs can be further reduced by using a gravel surface or a less expensive hard surface than asphalt.

To complete the evaluation, a comparison of the potential revenue that can be generated by each parking facility must be made. Persons who park in a conveniently located parking structure may be willing to pay a rate that covers a much higher percentage of the costs than the rate paid by users of a park-and-ride facility. Thus, the parking structure may be more financially efficient than the park-and-ride operation. This is but one of many possible trade-offs that should be considered in attempting to solve a campus transportation problem.

ELEMENTS ESSENTIAL TO SUCCESSFUL PLANNING

In attempting to prepare a campus transportation

plan, four important points should always be remembered:

1. Each campus is unique, which means that what is best for one campus will probably not work well on another campus, although their demographic characteristics are comparable.

2. The town-gown relationship is critical to the planning process. Local government agencies should be involved in the planning process or at least kept informed.

3. Campus policymaking groups should be involved as much as possible in the planning process. Planning or transportation committees should be allowed

to have input in the decision-making process because they represent the users of the campus parking and transit system.

4. Common sense should prevail at all times. This may seem evident but it often appears to be forgotten or neglected during the preparation of a transportation plan.

If these suggestions are followed, the development, acceptance, and implementation of a plan should be successful.

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Campus Traffic and Parking Problems and Some Solutions

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Traffic congestion and parking needs continue to present pressing problems for many college and university campuses in the United States. Questions must often be resolved in a traffic and parking analysis even though the solutions studied involve issues embodied in an overall master plan, which may be out of date. There are also concerns about the changing role of higher education and the possible demise of some institutions over the next several years. Each campus has its unique policies, problems, and planning parameters. In the analysis of traffic and parking questions, attention must often be given to such matters as financing limitations, planning the campus as part of the larger community, recognizing that campus travel demand is different from that of other areas, and protecting the campus core from vehicle-pedestrian conflicts. Procedures for setting overall parking demand should respond to the needs of the different population categories (faculty and staff, commuters, resident students, and visitors) as well as policies on how to meet transportation service demand.

Traffic congestion and parking needs continue to present pressing problems for many university campuses. Although questions are often presented solely from a transportation viewpoint, traffic and parking solutions involve more comprehensive questions that are properly addressed in overall campus master planning. Consideration of traffic and parking problems includes many aspects of overall campus planning, which can best be accommodated during the preparation of a master plan.

Obviously solutions to transportation problems must often be sought without the benefit of concurrent overall master planning. At such times it is necessary to make maximum use of previous planning efforts and current activities in relation to matters such as day-to-day campus operations, classroom scheduling, special events, basic philosophies and policies of university administration, and so forth. A number of campuses are currently facing major questions regarding their future role in education. There are concerns about changing roles within the system of higher education, including the demise of many campuses. These have led to an increased need to review immediate traffic and parking problems in the context of a difficult and changing future.

Each campus is unique and has its own set of policies, problems, and planning parameters. Among the recurring problems affecting traffic and parking on campus are the following.

URBAN CONTEXT

University campuses are a significant part of an

urban area, and their impact on the economy as well as needed services can be considerable, particularly in the case of larger institutions. A university will sometimes generate more daily trips to and from the campus area than the central business district of the city in which the campus is located.

Campus traffic and parking problems should be studied in the context of overall urban-area activities. Some major considerations are the following:

1. Just a few years ago less than half of the educational institutions in urban areas surveyed were active participants in the urban area transportation planning process. The institution should be an active participant in any continuing, cooperative, and comprehensive transportation planning process in the urban area. Urban areas with a total population of 50,000 or more are required by federal law to have such a process under way to maintain an areawide transportation plan.

2. Street and highway planning should take into consideration the special needs of institutions of higher education. These special needs include (a) heavy pedestrian flows in certain corridors; (b) bikeway needs; (c) periodic ebb and flow of traffic with class changes; (d) traffic peaking characteristics different from those of the urban area as a whole (often the university peak hour is at noon); (e) recurring special events, such as athletic events, conventions, and concerts; (f) extent of control through policy decisions by the institution; and (g) transit service needs.

3. Major streets should serve the campus as well as urban-area travel. At the same time, major streets should not divide the campus or penetrate unnecessarily into the heart of the campus. Too often, as an institution grows, street planning does not properly accommodate these changes or protect the integrity of the central campus.

4. When an inadequate number of parking spaces is provided by the university, a conflict often develops between local residents and persons traveling to the campus. Parking on local residential streets by persons destined for the campus can become a major problem. A recent study of an institution that has an enrollment of about 20,000 students and provides 7,017 parking spaces indicated that 1,091 vehicles (or 15.5 percent) were not parked in