CHAPTER V-TN 3: THE DEFINITION AND EVALUATION OF A CLASS OF ALTERNATIVE-SITE FUNCTIONS

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ABSTRACT

The effect of the availability of alternative locations at which to participate in an activity has long been recognized as affecting participation at a given site. In fact, it has been recognized that either having a variety of alternatives around a person's origin or having a variety of destinations around a possible destination means that origin and destination alternative factors should be considered in modelling travel behaviour.

A number of desirable characteristics of alternative functions are discussed in this paper and it is indicated that the particular class of alternative functions being considered satisfies each condition under specific conditions. Ways are shown in which the approach to defining alternative factors has been unnecessarily ad hoc.

The paper presents results that demonstrate that the coefficients (exponents of distance) that some researchers have used in defining alternative factors mean that distant alternatives are more important in determining people's behaviour than facilities that are close. The range of value of exponents that result in close alternatives being more important to people's behaviour than distant alternative is defined.

PURPOSE

The purpose of this note is to discuss the formulation of, and the problems associated with, an alternative-site function.

BACKGROUND

The seminal work on the use of alternative sites in travel modelling is probably Stouffer's intervening opportunity model (1940). Stouffer argued that the reduction in the number of trips to increasingly distant destinations was not a reaction to distance costs, but rather a reflection of the successful competing for customers by nearer facilities over farther facilities.

More recently, Grubb and Goodwin (1968) developed a techique for operationalizing the concept of competing facilities as a component in recreation travel models. In their work on visitation to reservoirs distributed around Texas, Grubb and Goodwin formulated a general visitation equation:

(1) $Y = AX_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5}$

WHERE

Y = the number of visitor days from origin i to reservoir j per unit of time;

X_1= population of origin i;

X_2= round trip travel costs between i and j;

X_3= per capita income at i;

X_4 = surface area of j;

X_5= a variable measuring the effect of competing reservoirs available to users at origin i on attendance at reservoir j, and

A,b1,...,b5 = parameters to be estimated.

In the context of this article the last variable, X_5, represents the major contribution of the Grubb and Goodwin study. Their competing-site or alternative-site function, to measure the impact of competition on reservoir j, was operationalized as:

(2) $X_5(i) = \Sigma_k (\log S(k)/D(i,k))$ WHERE k=1 to n;

$X_5(i)$= alternative-site factor for origin i, reflecting the existence of alternatives to destination j;

$S(k)$ = surface area of competing reservoir k;

D(i,k) = distance between i and k;
n = number of reservoirs within 100 miles (an arbitrary cut-off distance) of origin i;

The expected sign of b5, the coefficient of X_5, in a least squares regression solution is negative. Thus, attendance at reservoir j can be expected to decrease as: (1) the number of alternative reservoirs (within 100 miles) increases; (2) the surface area of alternative reservoirs increases; and/or (3) the distance to the alternative reservoirs decreases. Thus X_5 Is intended to reflect the competition from all other available reservoirs.

A number of authors have furthered this investigation by introducing alternative-site factors into their recreation travel models. One of the most recently presented models that utilized such a factor is a day-use visitation model developed by Cheung (see TN 1). Other formulations which have been included in travel models were developed by Cesario, Goldstone and Knetsch (1969), Stankey and Johnston (1969) and Elsner (1971). The effect of alternative sites has also been approached by examining them in a trade-off context. This approach considers the effect of alternative sites on the distribution of users among a system of competing facilities. A few relevant examples of this approach include the Ontario Tourism and Outdoor Recreation Plan Systems Model (1970), Wennergren and Nielsen (1970), Ullman and Volk (1962) and Knetsch and Cesario (1970).

THEORY

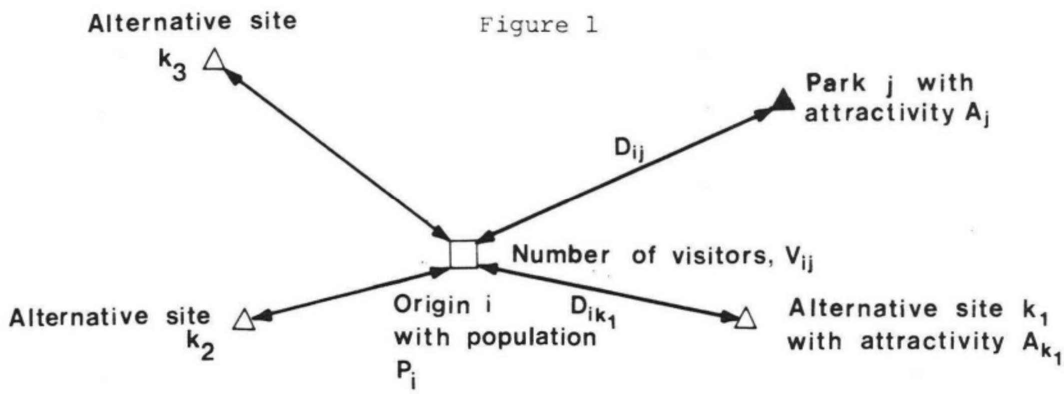
Figure 1 is used to present a simple graphic illustration of the alternative-site problem and some of the notations used in the following discussion of theoretical issues relating to the development of alternative-site functions. The volume of visitor flow from i to j is usually predicted on the basis of variables such as the population of I, the attractivity of j and the distance between them. A closer modelling of reality requires the inclusion of some measure of the competition of other facilities offering similar recreation experiences to the same user group. This is the purpose of introducing an alternative-site factor.

The omission of such a factor in, for example, the simple gravity model (which includes only measures of origin and destination characteristics, including distance, but not of alternative destinations) leads to the following logical, but unrealistic conclusion. Consider a simple unconstrained gravity model which predicts per capita use of a facility. If five more identical facilities are developed at the same distance from an origin, the gravity model implies that total per capita visitation at all sites wilt be six times as high as with one (i.e., it implies that demand is infinitely elastic with respect to supply). An alternative-site function embodies the more realistic assumption that total per capita visits may increase, but not at the same rate as the proliferation of new facilities.

There is an exception to this scenario that deserves mentioning, especially in light of the very high usage some recreation facilities receive. If a facility is being used to capacity for some given activity, then the addition of one identical facility may result in a doubling in per capita visit rates. This can be expected to occur whenever there is a latent demand for the services of a new facility. The solution to this apparent problem is the recognition that if a facility is being used to capacity, a gravity model is inappropriate. In this situation of very high demand and very low supply, the appropriate use-level forecasting techniques should be based on capacity measures.

Another consideration is that the reaction to alternative sites is largely a perceptual process. Consider now that a user at some origin is evaluating a large number of sites around him. It is quite feasible that, while he/she is able to distinguish among individual, nearby sites, she/he is unable to distinguish individual sites in a distant resort region. If he/she decides to go to this more distant region, his choice is based not on the sum of the attractions of the individual facilities in this region but rather on his perception of that region as a single "facility".

Figure 1: Alternative sites and use of alternatives



However, it is reasonable to suggest that once this user has arrived in that region and begins to make a choice between alternatives there, a second alternative-site function becomes important, a destination alternative-site function. This function is distinct from the initial alternative factor, which can be referred to as the origin alternative-site factor. The former is used to suggest, for example, that different stretches of a distant, developed beachfront compete with each other when (and only when) a user has arrived in the local area. Similarly, at home a user may decide among several National Parks, but once she/he arrives at the park chosen there may remain the choice between alternative campgrounds within that park.

It is possible to argue that this problem of perceiving at a distance differences between closely situated parks is solved by the attractivity factor included in the Grubb and Goodwin alternative factor formulation. However, the subsequent discussion shows that, in terms of the decision-making strategy outlined by the authors, the way a decision is made as to how one reacts either to comparable facilities competing with each other or to sub-units within a given park or beach, is best understood by considering both origin and destination alternative-site factors.

THE MATHEMATICS OF DEFINING AN ORIGIN OR DESTINATION ALTERNATIVE-SITE FACTOR: SOME GENERALITIES

White the authors have argued for a recognition of the possibility of a two-stage decision making process with regard to the ultimate choice of a recreation site, the general concepts and mathematics underlying each stage do not differ. It is possible to begin this section by offering three basic, important criteria against which any proposed alternative-site factor must be measured:

1. The competitive strength of any given alternative in an alternative-site function should be related to: (a) a measure of the attractiveness or utility of this alternative for a given usage; (b) the relative accessibility of the alternative from the "origin" of visitors (either their home or an equivalent point on the highway);
2. The magnitude of the alternative-site function should reflect some aggregate of the individual alternatives; i.e. the competitive importance of the alternatives as a group is directly related to some weighted total;
3. Any alternative-site factor should reflect the addition or subtraction of a new destination area within the field of existing possibilities.

These criteria, however, are operationally imprecise and vague in that they do not state even the direction of relationships between the variables.

Within the context of these general ideas, the aim of this paper is to describe how alternative factors should be defined (explicitly) so that irrational assumptions about the human decision-making process are avoided. The following mathematical derivations are presented as a context in which to analyze the alternative-site factors suggested by some researchers. The mathematics can thus be used as an example of the kind of matters that must be explicitly considered in order to define an alternative-site factor in both a mathematically and behaviourally acceptable manner.

Consider the following function which is a generalized Grubb and Goodwin alternative-site function:

(3) $X_i=\Sigma_k (A_k/F(D_{i,k}))$

WHERE k=1 to n

X_i = alternative-site function for some origin i;

A_k= attractivity of alternative site k;

$F(D_{i,k}))$= a function of the distance between I and k; and

n = number of alternatives.

This equation suggests that an alternative-site function is defined by the sum of the ratios of attractivities of sites to the distances of the sites from some origin. For an origin alternative-site factor, the origin is the visitor's residence, a city or the center of population of some region. In the case of a destination alternative-site factor the origin may be the point of arrival in the tourist region: an airport, the edge of town, a visitors' information office or the entrance to a park.

The attractivities that appear in the numerator can be measured in any of a number of ways, but current research in Canada suggests that, at least for the purpose of main-destination visits to a site, attractivity measures are best estimated using the Cesario model (see TN 4). The distance function $F(D_{i,k})$ is usually considered to be positively monotonic. This function can be based on several general measures: geographic distance, travel costs, travel time, or perceived accessibility. For example, a visitor to an unfamiliar resort town may impute a smaller distance to a facility whose location is on the main street, a couple of miles from him, than to a closer facility whose address is on an unknown side street.

Equation 3 clearly satisfies the three criteria enumerated above. If, for example, a new site is included within the area of available alternatives, the alternative-site function increases in strength as the attractivity-distance ratio for the new site is added to those of the existing alternatives. Also, the more attractive a given alternative is, the more important it is in determining the value of the alternative-site function compared to other sites equidistant from the point of reference, either an origin or destination. This statement is, of course, based on the fact that if two sites enter into the formula and are at the same distance, the one with the larger attractivity has a larger ratio of attractivity to distance and therefore adds a greater amount to the alternative measure than the less attractive site. As for the relative accessibility of a given destination, the inclusion of a distance function in the denominator indicates that as an alternative destination gets further from a given origin, the alternative factor calculated is less influenced by this given destination.

As a final point, it is desirable to discuss one apparent limitation of the alternative-site function. Consider a region with two existing facilities serving one city, i, shown in Figure 2: In this scenario a planner is attempting to decide between two possible sites for a new facility - one fairly close to i (site B), the other more distant (site A) but otherwise identical to site B. In forecasting expected use levels, the planner uses Equation 3 as a measure of the effect of alternative sites on attendance at the new facility. Recalling the components of Equation 3, it is clear that the value of the alternative-site factor is the same regardless of whether Site A or Site B is chosen. Nevertheless attendance at B, ceteris paribus, would surely be higher than at A. Now, some planners may feel intuitively that this is at least in part a reflection of A experiencing greater competition from the intervening opportunities at sites 1 and 2, than would B, which is closer to i than sites 1 and 2. This view implies that an alternative k has a different effect on trip flows from i to a destination j, depending on whether $D_{i,j}$ is greater or less than $D_{i,k}$. This in fact is the basic assumption in Stouffer's intervening opportunities model, in which only places that are closer to origin i than j is, are included in the operational definition of intervening opportunities. All other sites are considered to have no competitive effect on trips to j. It is to be argued below that this type of binary treatment of alternatives Leads to conclusions logically inconsistent either with observed trip patterns or with the assumption of a uniform utility function which is implicit in Equation 1.

However, before pursuing that argument, a more sophisticated equivalent to Stouffer's definition of the alternative-site factor is considered. The United States Corps of Engineers (1972) suggested:

(4) $X_i = [1 + \Sigma \log(S_k)/D_{i,k}]^2$

for all $\log(S_k)/D_{i,k} > \log(S_k)/D_{i,k}$, $i.\neq.k$ for k=1 to n

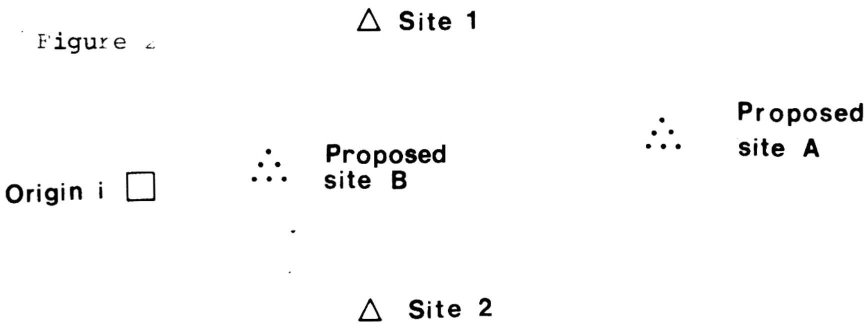
WHERE the variables are the same as defined for Equation 2.

There are three differences between Equation 4 and Equation 3. First, only those ratios of $\log(S_k)$ to $D_{i,k}$ which are greater than the ratio of log S_k to $D_{i,k}$ are included. In other words, if $\log(S_k)/D_{i,k}$ is less than $\log(S_k)/D_{i,k}$ then the alternative site k is not considered as an alternative at all. One (1) is added to the restricted summation to prevent X_i from equaling zero, since the Corps of Engineers used $1/X_i$ as a regressor in their estimation of reservoir use. Also the squaring of the quantity, one plus the summation, implies that the total effect of all substitutes increases at an increasing rate.)

The intuitive feeling that sites 1 and 2 constitute greater competition to site A than site B, reflects the assumption that the competitive strength of an alternative varies according to the relative location and attractiveness of the destination j being considered. The implications of this assumption are as follows. If it is argued that the volume of trip flows from origin i to j is unaffected by any site k whose $A_k/D_{i,k}$ is less than $A(j)/D_{i,k}$, then in a behavioural sense, this implies that the population at I do not consider any site k to be an alternative to j if $A_k/D_{i,k}$ is less than $A_j/D_{i,k}$. The corollary of this is that there is no reason for any trips from i to j if there exists any alternative k such that $A_kD_{i,k}$ is greater than $A_j/D_{i,k}$ since the latter, by the above assumption, does not constitute an alternative to and, therefore, competition for the former. In turn, and more fundamentally, this implies that for any origin one would expect all park users of the same type and with the same purpose to patronize the same park, since in all but very rare cases there is only one site which maximizes $A_m/D_{i,m}$, m = 1 to n. Observation does support all users of the same type and with the same purpose patronizing the same site and therefore observation contradicts the above implication of deterministic choice behaviour. A way to reconcile the deterministic behaviour implicit above with the reality of trip flows from i to more than one destination is to assume interpersonal differences in people's estimations of sites' attractivities and/or distances, so that the site with the maximum A(i)/D(i,j) will vary from person to person, and trip choices will vary accordingly. However, as presently written, Equations 2 through 4 do not allow for interpersonal differences in people's estimations of A_j and $D_{i,j}$, j = 1 to n. Thus

Equation 4 and (by implication) the intervening opportunities model are internally inconsistent.

Figure 2: Sites and a proposed site for considering influence of alternatives



It might be argued by some that the idea expressed by the intervening opportunities model and Equation 4 is basically sound as a macro model. The values generated are expected values based on stochastic assumptions rather than deterministic predictions for individuals. Still, an operational flaw in these models, however, is that they give no weight to sites whose $D_{i,j}$ or $A_j/D_{i,k}$ are less than $D_{i,j}$ or $A_j/D_{i,j}$. This could be overcome by giving smaller, but positive, weight to alternatives with relatively low $D_{i,k}$ or $A_k/D_{i,k}$. But this would require prior knowledge of the sites' attractivity values such as in Equation 4 where S_k is assumed to be a surrogate for A_k. And this leads to a type of circular reasoning. For example, if A_k (an attractivity factor) is to be estimated using a model with an alternative-site function (such as a Cesario model), then the estimates of attractivity depend on a knowledge of the alternative weighting factors which, in turn, depend on the attractivity value.

Though some iterative procedure might eventually be devised to overcome this problem, it is questionable if such an effort is merited since there is no behavioural evidence to suggest that this (or any other form) of variable weighting of alternatives takes place in the human mind. Therefore, a simpler assumption is made in the following discussion. Specifically, alternative sites contribute to the alternative-site factor in direct proportion to the value of $A_k/D_{i,k}$ (or some similar function). The result is that a weight of unity can be applied to each term in the summation in Equation 3. In other words, the competitive strength of alternatives is assumed to be a quality intrinsic to them and not something which varies according to the destination being considered. Given this assumption, and returning to the hypothetical planning problem, the greater usage of site B than A can still be explained in terms of site B having intrinsically greater strength than site A against the competition from sites 1 and 2, on account of B's attractivity-distance ratio exceeding A's.

THE CHOICE CF A DISTANCE FUNCTION AND A SET OF FACILITIES TO BE CONSIDERED AS ALTERNATIVES TO A GIVEN FACILITY

Now that an alternative-site measure has been formulated, X_i, which satisfies the criteria for such a measure, it is tempting to accept it and use it without considering further the behavioural implications of the measure. However, it is a simple matter to show that the function has very different properties depending on the way $F(D_{i,k})$ is defined. For example if:

(5) $F(D_{i,k}))= D_{i,k}[a]$

WHERE

$D_{i,k}$ = geographical distance between i and k, and a = some exponent to be estimated.

then the value of the exponent has a profound effect on what X_i suggests about the decision making process. There are, in fact, two considerations:

1. how the universe of alternatives is defined (in areal terms),
2. what distance function should be used.

And, an important point to note is that the two issues cannot really be dealt with separately.

The question of the areal delimitation of the population of alternative sites was an issue in both the Grubb-Goodwin (1968) and the Cheung (TN 1) studies. Their arbitrary resolution was to define the population of alternative sites as that group of similar facilities located within i00 miles of the origin. Although arbitrary, Cheung did find empirical evidence that this radius was a reasonable one for planning purposes. He found that 90 percent of day-use visitors to a group of parks traveled less than 100 miles one-way to a park. From a relatively loose, practical viewpoint one can ignore the existence of distant parks; out from a more precise, theoretical viewpoint one can still acknowledge their influence, even if it is minimal, because of the visitor's reaction to distance.

Whether people consider alternatives only within a certain distance is related to a theoretical concern that has implications for defining alternative factors which are not pursued here. So the reader is asked to keep in mind that the arguments presented do not adequately deal with how people react to different distances (See TN 14). Early location and transportation models typically presented the view that "economic man" was hyper-sensitive. For example, consider two equally attractive parks, A and B. If A is located at 10 kilometers from a potential user, and B is 10.1 kilometers from this user, these models argued that A would always be chosen over B. A more realistic view of the perception of distance differentials is one that describes the rational man as being threshold-sensitive. In the case just presented, most users would not be sensitive to a margin of 0.1 kilometers. If, in a different situation, the facilities were located within a few hundred meters of the user, a marginal increase of 0.1 kilometers could be significant. This threshold is referred to in psychology as the just-noticeable-difference (j.n.d.), and it has been shown in psychophysical experiments to be proportional to the magnitude of the stimulus, in this case distance. If distance is implicitly used to define the set of parks that serve as alternatives for another park (as it was used above) any number of distance functions may be considered relevant.

Figure 3 shows a hypothetical distribution of parks around an origin. Ten rings, equally spaced, surround an origin I. In the hinterland, covered by the rings, are a number of parks. For purposes of this discussion they have been uniformly spaced on a rectangular grid. The distance to any circle, j, from the origin, is DR(j) the distance to the next more distant circle from the center is DR(j+1). The distance between any two adjacent circles (the width of any ring) is "w" and this is constant. One unit of area has been sketched on the map and-is sized so that it encompasses four parks. Thus the density of parks, "d", is four parks per unit area. If this square area unit has sides of one unit, application of the Pythagorean Theorem indicates that w, the width of the rings, is about 0.7 units. The outer circle encompasses the maximum distance that one is physically able to drive round-trip in one day, with just a minimal amount of time spent at a site. The extreme example would be the case where a user drives 110 kilometers per hour (about 70 mph) for 12 hours, hops out and back into his car in a second (thereby qualifying as a visitor) and drives home at 110 kilometers per hour for 12 hours. The outer ring, the physical limit for a day-use trip, is 110 km x 12 hours = 1320 kilometers. In nearly all real-life day-use instances, this physical limit is not even closely approximated. Its use, however, avoids drawing a smaller arbitrary boundary based on intuition or limited knowledge of past behaviour. The physical maximum also avoids the unrealistic and mathematically difficult situation of an infinite travel surface.

One of the first things that is noticed when one examines the figure is that the successive rings of equal width, moving away from the origin, include an increasing area. Given a uniform distribution of parks in space, as shown, the further one goes away from the origin the greater will be the number of sites included in a ring. The average number of parks per unit area is d, so the number of parks that may be expected to be found between any two circles is:

(6) N = area of ring * density of parks

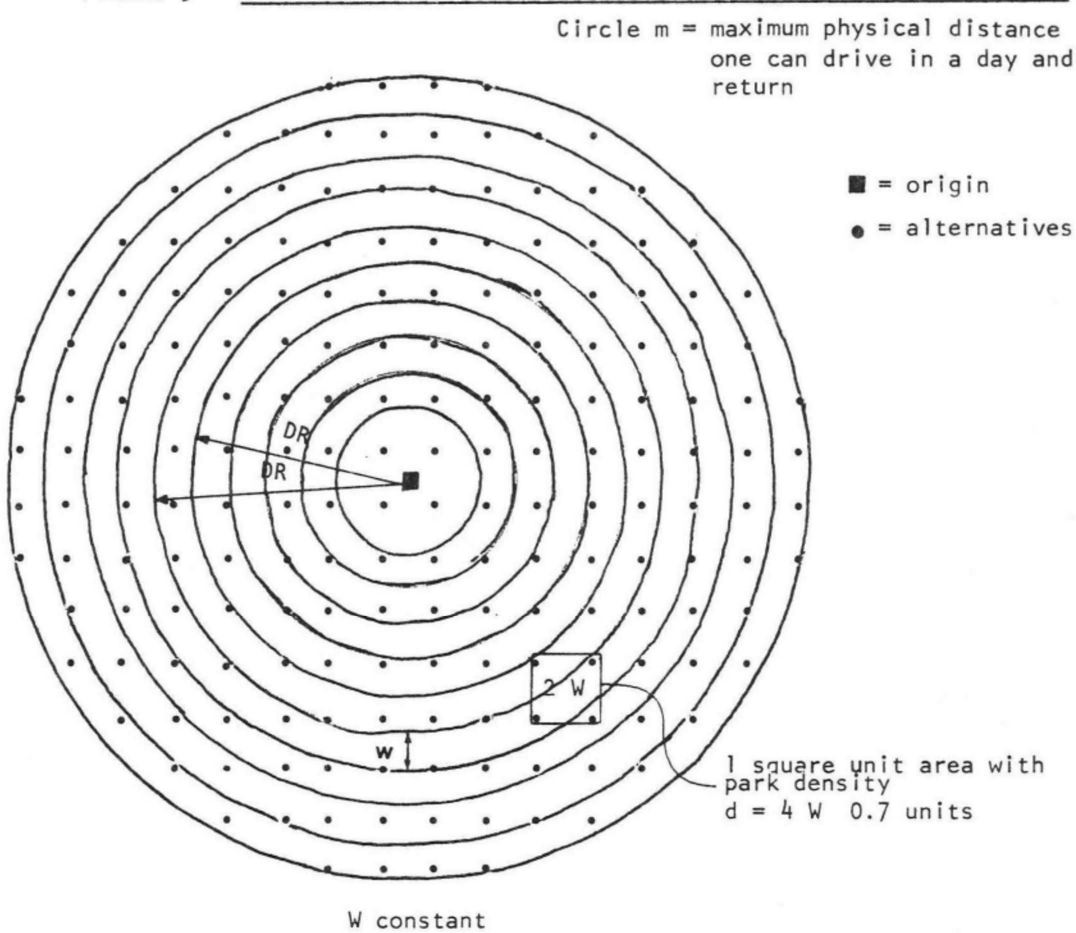
$= [(2\Pi\, DR(j) + 2\Pi\, DR(j+1))/2)\}(w)(d)$

AND since $2\Pi\, DR(j) \approx 2\Pi\, DR(j+1)$ if w is small compared to DR(j)

THEN:

(7) $N \approx 2\Pi\, DR(j)(w)(d) \approx 2\Pi\, DR(j+1)(w)(d)$

FIGURE 3 HYPOTHETICAL DISTRIBUTION OF DAY USE PARKS AROUND AN ORIGIN



WHERE N = expected number of parks in a ring; DR(j) = radius of inner circle;

DR(j+1) = radius of next outer circle; w = width of ring;

d = average park density.

If we assume all parks are equally attractive, the attractivity component in Equation 3 can be taken as a constant, σ, and the alternative-site function can be rewritten as:

(8) $X_i = \sigma\, \Sigma_k\, (1/F(D_{i,k})$

WHERE σ = attractivity of all alternative parks; a constant

If, however, we let $DR(j) >> W$, then the distance from the origin i to all the alternatives in the ring between j and j + 1 is approximately $DR(j) \approx DR(j+1)$. In other words, if the ring width is sufficiently narrow, the distance to all parks in the ring is approximately equal to the distance to either the inner or the outer boundary of that ring. Hence DR(j) can be substituted for $D_{i,k}$ in Equation 8, where k is a park in the ring between circles j and j + 1. Using Equation 7 as an estimate of the number of parks in any ring, Equation 8 can be rewritten as:

$$(9)\ X(i) = \sigma \Sigma_k\ 2\Pi\ DR(j)(w)(d)/F(DR(j)\ j))$$

WHERE m - 1 = number of inner circles; and the summation is over m-1 inner circles; and the other variables are as defined in Equation 3, 7, and 8.

Moving the constant terms outside the summation gives:

$$(10)\ X(i) = \sigma\ (2\Pi)(w)(d)\ \Sigma\ DR(j)/F(DR(j))$$

WHERE the summation is over m-1 inner circles.

One question that was raised earlier, and remains unanswered is the choice of an appropriate distance function in the alternative-site function F(DR(j)) in Equation 10. The most common form of F(DR(j)) defines it as an exponential function, so that in the following section:

$$(11)\ X(i) = \Sigma_j\ DR(j)/DR(j)^a$$

because $F(DR(j)) = DR(j)^a$

with the summation over m-1 inner circles.

Table 1 is a summary of the values of X(i) from Equation 10 for different values of a. To prepare the Table σ has been set to unity, w = 0.7 units, d = 4 parks per square unit and DR(j) ranges from 0.7 to 7.0 in increments of 0.7.

Examination of the cells in Table 1 permits one to draw behavioural inferences about each value of a. For those values below unity, the nearer parks contribute relatively Little to the total strength of the alternative–site factor. For an a = 0, approximately 50 percent of the competition to some park comes from the large numbers of parks in outer zones 8, 9 and 10. Cheung suggested using an exponent of 1 (one) in his Saskatchewan day–use model. Table 1 indicates in this hypothetical case that, again, the nearer parks play a relatively small role in determining the total alternatives perceived at the origin. Specifically, less than 50 percent of the total day–use competition comes from the first six zones. Thus, if an exponent less than one is chosen for, the researcher has, explicitly or implicitly, stated that the total number of parks within the maximum physical driving range for day–use activity is more important than just the smaller number of closer, more accessible parks. For example, when a=1, even though the attractivity-distance ratio is considerably greater for a park in (for example) ring 2 than in ring 10, so that a park in ring 2 has two to three times the chance of being chosen than one in ring 10, there are about seven times as many parks in ring 10 as in ring 2. As a result, there is a higher probability of zone 10 being visited more than zone 2.

An interesting consequence of this would be that a graph showing numbers of visitors (on the y–axis) against destination distance (on the x–axis) would have a positive slope. In the past, students of spatial interaction derived such curves and drew conclusions about the friction of distance from the slope. It bears emphasis that the slope of this curve is so biased by the spatial distribution of alternatives, as is vividly shown in this example, that it is quite useless in estimating the friction of distance. In the present example the conclusion from the positive slope would be that distance had positive rather than negative effect on usage, even though Equation 11 indicates the opposite. Even so, some current research based on more sophisticated methods than the distance decay curve still ignores the biasing effect of the spatial distribution of alternatives on trip flow data.

A different inference can be drawn from the results when "*a*" is greater than unity. Distance and travel costs play much more important roles than previously, and can be considered more important than the increasing number of parks or distance in influencing the probable maximum distance a user will drive. The increase in the relative competitive advantage of nearer sites increases rapidly with higher *a*-values. For an *a* = 2, most of the competition in this example comes from the first three zones; for *a* = 3, most comes from the first zone; and for *a* = 5 nearly all comes from the very closest parks.

TABLE 1
SUMMARY OF THE EFFECTS
OF A CLASS OF ALTERNATIVE-SITE FUNCTIONS
Percent of Alternative-Site Function
Value Attributable to Each Ring

	(inner)								(outer)		
a	1	2	3	4	5	6	7	8	9	10	X(i)
0	2	4	5	7	9	11	13	15	16	18	676.8
1/2	4	6	8	9	10	11	12	13	13	14	332.3
1	10	10	10	10	10	10	10	10	10	10	175.8
3/2	20	13	12	10	8	8	8	7	7	7	105.5
2	33	17	12	10	7	5	5	5	5	2	73.8
3	68	16	6	4	4	4	*	*	*	*	54.5
5	93	5	2	*	*	*	*	*	*	*	77.4

* Less than 1%

Further interpretation of the higher a-values suggests that they may be appropriate for, for example, the day-use activities of small children, the elderly, the handicapped and the otherwise immobile. Conversely, very low a-values would more logically apply to highly mobile individuals; and perhaps to a special class of day-users who may desire to visit several facilities in one day.

CONCLUSION

The point of the preceding discussion is that there are behavioural implications that need to be considered when making what may seem to be a strictly empirical decision. The use of an alternative-site function in a day-use model necessitates the researcher having an explicit awareness of his study population and activities. A recognition of the behavioural or human forces operating in a recreation system should be considered, and used to evaluate the implications of any given empirical solution. At the extreme, then, it is conceivable that a model with a high R^2 should be rejected for planning purposes because of possible misleading or nonsensical behavioural interpretations of the empirically elegant model.