

# An Approach to the Study of Local Road Management

J. W. SPENCER, *Highway Research and Extension Engineer,*  
*Dept. of Agricultural Engineering, Cornell University*

How can the effectiveness of road department management be appraised? If management, by some criteria, is considered to be effective, what are the characteristics of the effectively managed road department?

An exploratory approach to the study of local road management, centered on these questions, is discussed in this paper. The development of several groups of characteristics, compiled as a hypothetical verbal model of effective management, and an approach to evaluating the relative effectiveness of operating road departments are examined.

This paper summarizes the principal features of a study of the extent to which the selected characteristics were present in each of six county road departments. Subjective appraisals of management effectiveness in these counties are presented.

A critical evaluation of the approach used and of several features of the methodology is attempted, and it is offered as an aid to furthering research in this field.

- HOW LOCAL road management may be most effective has been a concern of management itself, the public, and the researcher. The problem of "What is good management and how is it achieved?" has received considerable attention but, because of the scope of the problem and the elusiveness of convenient "toe-holds," there has been more success in gaining and sharing varied experience and observations than in making a direct approach to the problem.

The lack of direct approach does not reflect a lack of progress. Individual road officials have frequently shared their experience. Many magazine articles discuss how a particular local road department operates or how it handles a particular management problem; and, in an effort to guide application elsewhere, the environment of experience is often rather carefully defined. There have been studies by outsiders as well as reports from insiders. These studies range from management surveys by outside consultants which are pointed toward specific recommendations for a particular road depart-

ment to case studies which describe, often in great detail, how particular road departments function.

Generalizations are dangerous, but it might be said that most research in local road management has been centered on the methods of a particular road department or group of departments, or on a particular function of the management process. Such studies are valuable in that they have contributed to experience, but conclusions or principles for wider application are still lacking. Researchers have observed and have attempted to evaluate their observations, but they have not yet derived tested essentials of effective local road management.

Perhaps a focus for management research can transcend specific environment. Centering attention on the management organism, perhaps an approach could be used which would compile available experience and observations into a hypothesis or verbal model of effective management and test the utility of the model in predicting management effectiveness. An approach of formulating and

testing a hypothesis or model has, of course, been widely used in many areas of scientific research.

#### SCOPE AND ENVIRONMENT

The purpose of this study was to explore the possible application of a model approach to the study of local road management. An effort to compile and test a primitive model is discussed, not as an end in itself but in an attempt to evaluate approach and methodology for research in this field.

In exploring the application of a model approach to research in local road management four distinct steps were as follows:

1. Compile from available experience a hypothetical model or list of characteristics of effective local road management.
2. Determine to what extent several county road departments conform to the hypothetical characteristics.
3. Obtain some appraisal of the relative management effectiveness in these same departments.
4. Compare the extent to which counties conform to the hypothetical characteristics with appraisals of relative management effectiveness in these same counties.

Six county road departments in California provided the environment for this study. It is important to note that although the study was centered in these counties it was not a study of these counties. The county road departments were not being evaluated against the preconceived model; the only intended judgment was of the adequacy of these preconceived characteristics in predicting or defining effective management. Because of the confidential nature of much of the information gained and for other obvious reasons, these counties are referred to only as counties A, B, C, D, E and F.

#### EFFORT TO APPLY MODEL APPROACH

A model is an abstraction. Considering a possible verbal model of road de-

partment management, an infinite number of characteristics could be listed. Though relevance of a hypothetical characteristic is purely a matter of judgment until it is tested, the choice of characteristics for the model used in this study was guided by personal judgment of what would seem to be most important to effective local road management.

A model is obviously arbitrary. Although, in practice, a model is stimulated by data and experience, Bross (1) suggests that a model represents an act of creation, like a painting. In contrasting the scientist's model and the artist's creation, he offers the humbling reminder that in art the portrait is the end of the job whereas in science it is just the beginning.

In an attempt to make use of the broadest experience and thinking, a hypothetical model of effective management was based largely on a review of references in the fields of business and public administration (2, 3, 4, 5, 6, 7, 8).

To provide a helpful framework for abstraction, a functional breakdown of the management organism was sought. Koontz and O'Donnell (2) suggest that the general functions of management are organizing, staffing, directing, planning and controlling. These five functions, plus the function of coordinating, were used as a conceptual framework for the hypothetical characteristics of effective road department management. Because management is interrelated with and dependent on the administrative process usually centered in a board of supervisors, the framework of the verbal model was extended to include some hypothetical characteristics of sound administration.

Within this seven-part framework, some 67 characteristics were compiled (see Appendix). The characteristics refer largely to the personal aspects of administration and management in general and, for the most part, are not peculiar to local road administration and management. Although it is convenient to separate functions within a framework and to separate characteristics within each of the functions, it is obvious that neither

functions nor characteristics are distinct, by nature or on a time scale.

### *Evaluation of Conformity to Characteristics*

*Method Used.*—The test of a model is utility. A model of a proposed airplane may, after testing at the model stage, be evaluated by reproducing it full-scale to see how it performs. A hypothetical model of local road management cannot readily be reproduced to study its performance. It seems that the most feasible method of appraising a model in the management area should begin with a check of the extent to which practices in several operating road departments conform to the characteristics in the verbal model. Ignoring, for the present, the relative effectiveness of the road departments in counties A, B, C, D, E and F, how can the extent of conformity to the hypothetical characteristics be evaluated?

The primary method selected for this study was selective interviewing. Interview forms were designed for Board members, the road commissioner, supervisory personnel responsible directly to the road commissioner, supervisory personnel not responsible directly to the road commissioner, and non-supervisory personnel. Questions reflecting characteristics in the hypothetical model were prepared for one or more levels in the organizational hierarchy—from Board members to non-supervisory employees. Questions asked Board members referred only to the administration area, but questions pertaining to management charac-

teristics usually were pointed to more than one level in the road department organization structure. An example of the questioning pattern for a sample characteristic is given in Table 1.

The pattern of interviewing in a particular county was, generally: (a) two Board members selected by the road commissioner; (b) the road commissioner himself; (c) three or more division heads (here defined as "supervisory personnel responsible directly to road commissioner"); (d) other supervisory personnel, including at least one person at each level in the division responsible for maintenance (this sampled at least one person at each step in the "chain of command" of a functional area present in all of the county road departments); (e) at least one non-supervisory employee in the maintenance group and additional non-supervisory personnel as time permitted.

A total of 65 persons were interviewed in this study, a range of 9 to 13 persons per county. Where choices existed in the general pattern of interviewing, the choices were usually made by the road commissioner, sometimes on a random selection basis but more often on a basis of geographical convenience. Interviews were private and persons interviewed were advised that their comments would be completely confidential. Each person was advised that this was not an effort to rate, criticize or recommend improvements in his county.

It was attempted to obtain evidence concerning extent of conformity with two of the characteristics by means other

TABLE 1  
DIRECTING: CHARACTERISTIC 2

Direction is by mutually recognized objective rather than by domination; effort is focused on what the job rather than what the boss demands. There is a definite awareness, at all levels, of over-all department objectives as well as specific job objectives.

Position	Questions
Road Commissioner	Do all levels in the road department seem to be aware of over-all department objectives as well as specific job objectives?
Supervisory personnel responsible directly to Road Commissioner	Are you kept fully aware of over-all department objectives as well as specific job objectives? Do you find that your efforts are focused on what the boss demands or on what the job demands?
Supervisory personnel not responsible directly to Road Commissioner	Do you find that your efforts are focused on what the boss demands or on what the job demands?
Non-supervisory personnel	Do you find that your efforts are focused on what the boss demands or on what the job demands?

than interviewing. An appraisal of the extent of conformity to characteristic 19 in the organizing function, pertaining to decisions made at upper levels, was attempted by leaving a form with the road commissioner and each of the division heads interviewed. Each of these persons was requested to jot down, for a "typical" day, all decisions made by him personally and decisions referred to others and to whom referred. Appraising the extent of conformity to characteristic 9 in the staffing function was attempted by means of an appraisal of performance form or "fitness report." Factors rated in this appraisal are listed in the Appendix. Board members rated the road commissioner, the road commissioner rated all division heads. From there on down in the organization structure, each person interviewed was asked to rate his immediate boss as well as any supervisory personnel responsible directly to him.

*Summary of Results.* — Based on evidence and impressions gained from the contacts in each of the six counties, a quantitative rating of the extent to which each county conformed to each characteristic was attempted. Although evidence and impressions were of a qualitative nature, an effort to quantify was necessary if apparent correlations of the extent of conformity and management effectiveness were to be considered. The ratings and general criteria were:

Rating	Criteria
0	Apparent non-conformity.
1	More non-conformity than conformity.
2	Insufficient or conflicting evidence and impressions.
3	More conformity than non-conformity.
4	Apparent conformity.

Ratings of the extent of conformity or non-conformity were obviously subjective. The elimination of bias in such ratings is impossible, although the intended frame of mind was that appraisal was of the characteristic and not the road department. There is some tendency by

the researcher to consider that the characteristic is sound and find himself appraising the management in a particular county. In a spirit of generosity, there may even be a temptation to give the county the benefit of a doubt on a particular characteristic. An attempt was made to resist such tendency and temptation, keeping in mind that the validity of a characteristic was unknown and that a rating of conformity was not a credit or a discredit to a road department. Unless there seemed to be rather definite indications of conformity or non-conformity with a particular characteristic, a rating of "2" was given. This "2" slot became rather widely used, sometimes because evidence was conflicting but perhaps more often because of insufficient information.

The effort to rate the extent of conformity of each county to each of the characteristics is summarized at the top of Figure 2. For convenience rather than because of any knowledge of valid weightings, an average of the ratings on characteristics in each functional group is shown for each county. The average is plotted graphically for consideration later in this paper.

#### *Appraising Management Effectiveness*

*Viewpoint.* — The word "effective" as applied to management is frequently used but seldom defined. Millett (3) suggests that management effectiveness would seem to depend on three factors. His first factor is the state of personal relations within a management group and between management and subordinate groups, the second factor is work accomplishment, and the third factor is efficiency.

For this study, these three factors were considered in appraising relative management effectiveness in the six counties. It would have been desirable to approach the second and third factors objectively but because of a lack of generally accepted measures of management effectiveness and lack of time to attempt the development of objective measures, all three factors were approached solely on

an opinion basis. Although an inventory of opinions may reveal items of interest to the researcher, the unavoidable influence of personal bias emphasizes the need for the development of valid, objective, and desirably quantitative measures of management effectiveness.

*Method Used.*—Every Board member and road department employee in the six counties received a form on which he was asked to appraise each of the three factors as exceptional, very good, good, fair or poor. These factors, as qualified on the form, were:

1. State of personal relations (how people work together and seem to "get along").
2. Work accomplishment (how the department seems to be getting done what needs to be done).
3. Efficiency (the extent to which what is done is done at minimum cost).

An introductory note advised that an individual's frank appraisal would be held confidential. A plain envelope was provided so that each response could be sealed before it was submitted to the road department office for relay to the University.

Several residents of each county were asked to rate work accomplishment and efficiency of the road department. The form was similar to that distributed to employees and Board members, except that space was left for remarks. In each of the six counties, from 17 to 40 persons were asked to express an opinion. In each county, these persons were selected by or in cooperation with the road commissioner. In most cases, they were representatives of chambers of commerce, farm groups, and civic groups. In smaller counties, individual citizens, usually farmers and ranchers, were selected. A letter was sent by the road commissioner to each, explaining the study and asking him to complete the enclosed form. An envelope was enclosed so that the form could be mailed directly to the University. Returns from the public ranged from 59 to 87 percent in the six counties.

*Summary of Results.*—Figure 1 summarizes the personal appraisals of the factors considered by Millett to be related to management effectiveness.

It was suggested earlier that the use of personal opinions in appraising management effectiveness leaves much to be desired. The influence of bias is unavoidable. Although opinions of department employees, Board members, and county residents may shed some light on the state of internal and public relations, these same internal and public relations may well cloud a realistic appraisal of management effectiveness.

It is beyond the scope of this paper to discuss the many implications of the opinion survey summarized in Figure 1. It should be pointed out, however, that the usually small variance among ratings of the three factors by a particular group in a county would suggest that these opinions probably reflected a degree of over-all satisfaction rather than a discerning appraisal of the individual factors. It was noted that the average appraisal (all three factors), and especially the efficiency appraisal by road department supervisory personnel, generally decreased with increased size of road department. Opinions of other groups did not appear to be related to size of road department.

When opinions are subsequently referred to as an appraisal of management effectiveness, it is not assumed that they represent an adequate appraisal. In the absence of a needed objective measure of effectiveness, however, the opinion survey provided some rough indications of effectiveness necessary for the next step in an exploration of a model approach.

#### *Comparison of Conformity with Management Effectiveness*

*Method of Comparison.*—Although it would be possible to check the correlation, if any, of extent of conformity to individual characteristics with the appraisals of management effectiveness, such refinement cannot be justified in this study. Because of limitations of the data, and since individual characteristics

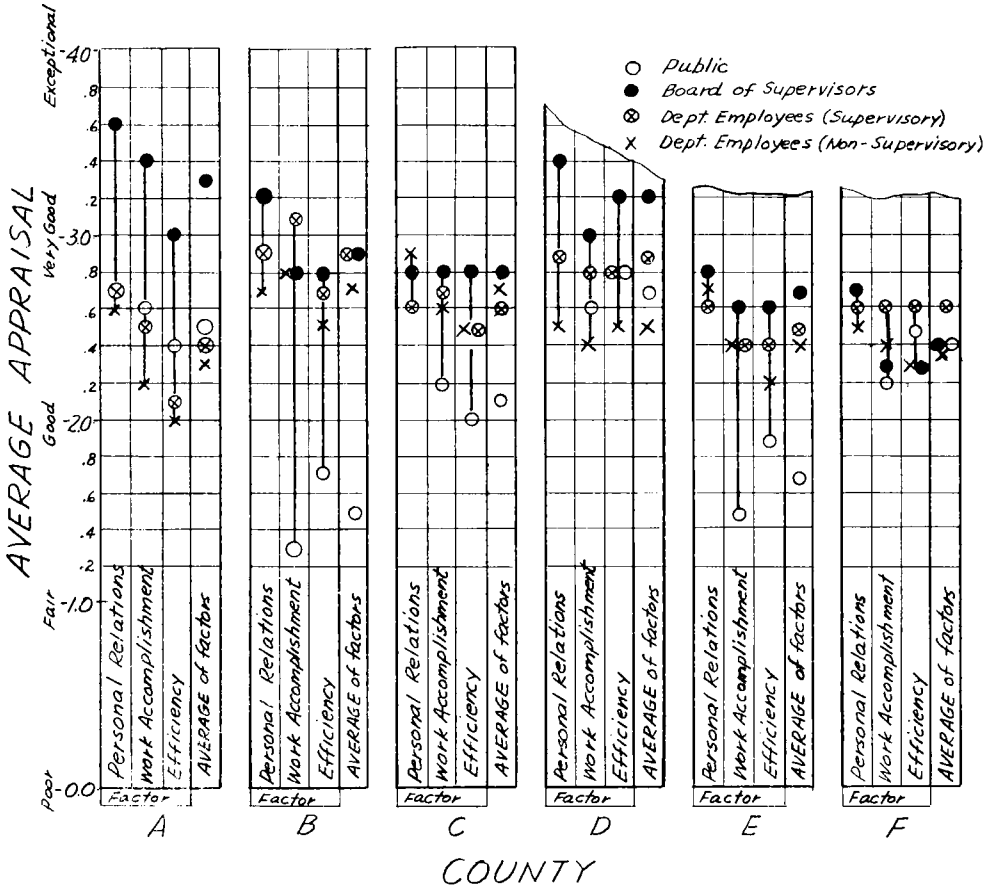


Figure 1. Appraisals of management effectiveness based on averages of personal opinions.

are more or less related as contributors to a concept of each function, it was decided that refinement in this study should not exceed the consideration of characteristics in functional groups.

A mathematical approach to correlation was not considered to be justified. Scatter diagrams are presented (Fig. 2) to provide visual inspection of indications or trends. The abscissae have already been discussed; the ordinates, from Figure 1, are the average appraisals of management effectiveness (all factors) by the several groups from whom opinions were obtained.

*Trends.*—Although the information on these scatter diagrams is not to be taken as having the precision associated with physical measurements and mathemati-

cal correlation is not implied, a general observation and comments on several apparent trends are offered. Except for the average public appraisal in two of the counties, all other ratings of effectiveness (ordinates) were good or higher. This may indicate only that “good” tends to be a lower limit in such appraisals, or it may indicate that public and board satisfaction, as well as employee morale, are quite high in this sample of six counties. Turning to average ratings indicating extent of conformity to the functional groups of characteristics (abscissae), the only average ratings indicating more non-conformity than conformity were of one county in coordinating, one county in controlling, and two counties in planning. Stating this observation differently,

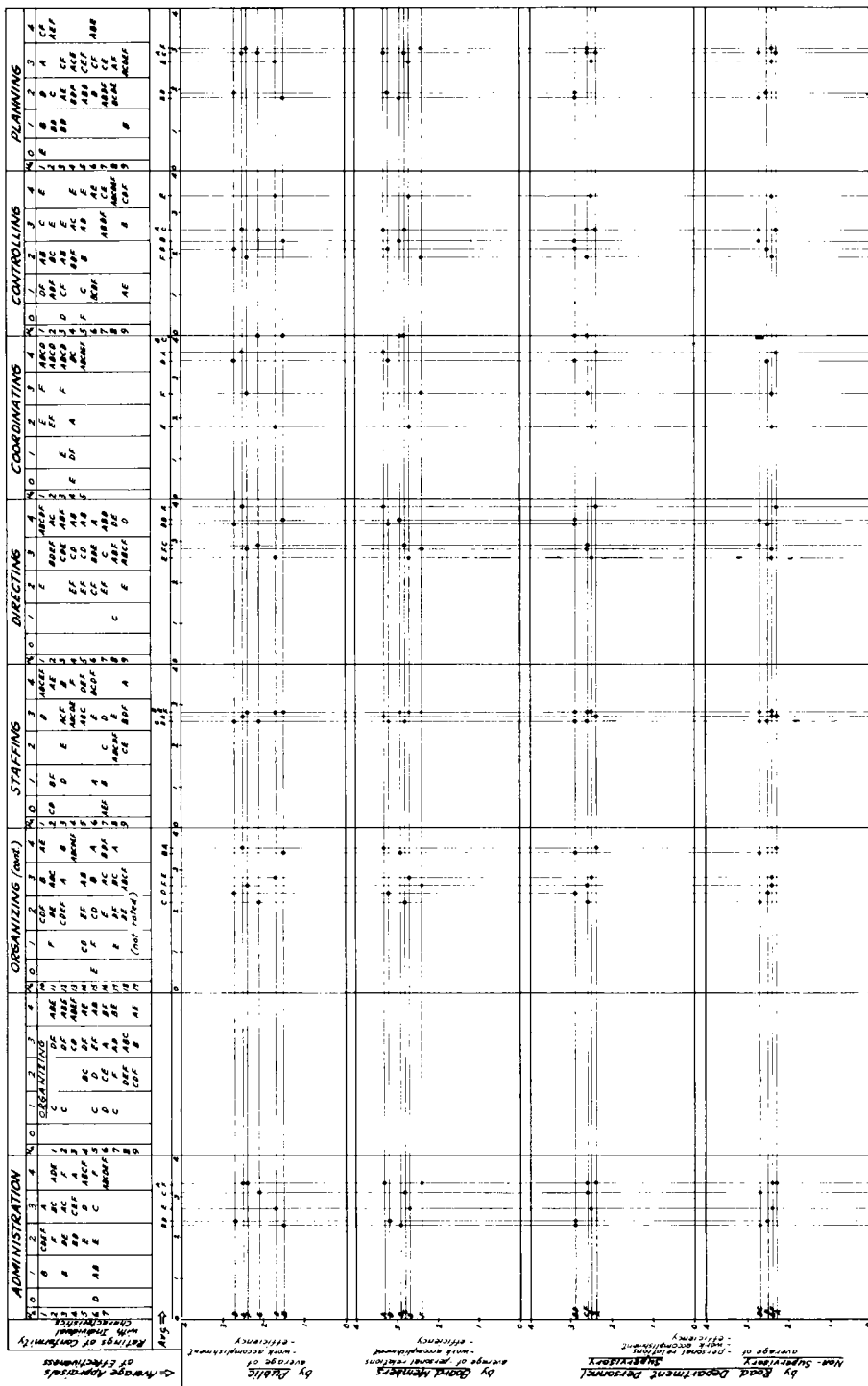


Figure 2. Extent of conformity with functional groups of characteristics vs appraisals of management effectiveness.

most points on the scatter diagrams fell in the upper right quarter.

From this upper right quarter pattern on the scatter diagrams, one might possibly suggest that management effectiveness is generally correlated with conformity to functional groups of characteristics because where more conformity than non-conformity exists, effectiveness is in most instances rated as good or higher. Before such a suggestion could be considered seriously, it would be necessary to appraise management effectiveness of a sample of local road departments which do not generally conform to the hypothetical characteristics. It is possible that the functional groups of characteristics represent such generally accepted concepts that definitely non-conforming counties would be difficult to find — and that even if they could be found, the subjective appraisal of effectiveness as used in this study might very likely average good or higher. In this age of superlatives, "good" may represent to many people a lower limit of acceptability. Although the upper right quarter pattern on the scatter diagrams might lend some encouragement to the compiler of a model, a critical look at apparent trends within the sample of six counties provides some insurance against complacency. Whereas location of a scatter of points in the upper right quarter may possibly suggest a general desirability of conformity to a particular functional concept, only trends in alignment of the points may suggest whether management effectiveness is related and sensitive to extent of conformity.

In discussing possible indications from the scatter diagrams in Figure 2, neither cause-effect relationships nor conclusions are implied. Recognizing shortcomings in the data, the testing of the primitive model is discussed because apparent trends may, in themselves, be of some use in future research but, especially, because a discussion of trends serves to trace the exploration of a vital step in a model approach:

1. With increasing conformity to the

sound administration group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Public	Increase
Board members	Decrease
Supervisory personnel	Decrease
Non-supervisory personnel	Decrease

Reviewing the characteristics comprising this group, it is easier (for a biased observer at least) to rationalize why public appraisal of effectiveness would increase with increasing conformity than why other appraisals would decrease. It seems reasonable that public satisfaction should increase with increasing attention to objectives and policies, political responsiveness, etc. As for the decreases, it might be rationalized that elected Board members possibly could derive more personal satisfaction from individual rather than group relationships with the public and department head, and from minimum delegation of authority to the department head; perhaps, too, definite objectives and policy tend to cramp political flexibility. Considering decreases in appraisals of road department personnel, it is possible that increasing conformity with these characteristics is reflected by the department head spending more time in relations with the Board and public and, hence, having less time for intimate contact with day-to-day road department operations.

2. With increasing conformity to the organizing group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Public	Decrease
Board members	Increase
Supervisory personnel	Decrease
Non-supervisory personnel	Decrease

It seems reasonable that Board appraisal should increase with in-



creasing clarity of organization pattern. It would seem that conformity with this group of characteristics would tend to reflect a "tight ship," and appearances of rather well-defined relationships may well be appealing to Board members. Possible reasons for decreasing trends are again less apparent to the biased observer. With non-supervisory personnel and supervisory personnel at lower levels, a more clear cut organization pattern may possibly cause an individual to feel more distant from top management than he would feel in a looser, family-style organization.

3. With increasing conformity to the staffing group of characteristics: There are no apparent trends. The ratings of degree of conformity of the six counties to this group of characteristics are more closely bunched than in any other group. This close bunching and lack of trend may have been influenced by two somewhat paradoxical characteristics — a merit system on the one hand, and a practice of consulting subordinates in leadership selection on the other. Omitting first one characteristic and then the other spreads out average ratings for this group of characteristics and some trends become apparent.

a. Omitting characteristic 2 concerning a merit system:

<i>Appraisal by</i>	<i>Trend</i>
Supervisory personnel	Increase
Non-supervisory personnel	Increase

b. Omitting characteristic 7 concerning consultation of subordinates in leadership selection:

<i>Appraisal by</i>	<i>Trend</i>
Supervisory personnel	Decrease

Statements concerning the result of such manipulation are beyond

the scope of this study and must be made very cautiously. There is some indication, however, that the morale of road department personnel, especially supervisory personnel, may be more related to a practice of consulting subordinates in leadership selection than to the existence of a merit system. This general indication is verified by considering these two characteristics individually on a scatter diagram.

4. With increasing conformity to the directing group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Public	Increase
Board members	Increase
Supervisory personnel	Increase

This group of characteristics refers essentially to a democratic relationship between boss and subordinate.

5. With increasing conformity to the coordinating group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Supervisory personnel	Increase
Non-supervisory personnel	Increase

The range in degree of conformity of the six counties with this group of characteristics is wider than with other groups. Although the scatter diagrams suggest an increasing trend, the flat slope might suggest that effectiveness as reflected by employee satisfaction is related although rather insensitive to this group of characteristics.

6. With increasing conformity to the controlling group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Public	Decrease
Supervisory personnel	Decrease

Considering the public appraisal, a possible explanation for a de-

creasing trend is not evident. Considering the supervisory personnel — without county E in the sample, a decreasing trend would not be indicated. In this particular county, strong competition has been induced. The earmarks of control are similar to the earmarks of competition but where a spirit of competition reaches a point that coordination may be impaired (see county E rating on *coordinating*) it is perhaps understandable why morale or job satisfaction may be lower than where such strong competition does not exist.

7. With increasing conformity to the planning group of characteristics:

<i>Appraisal by</i>	<i>Trend</i>
Public	Increase
Board members	Decrease
Supervisory personnel	Decrease
Non-supervisory personnel	Decrease

It seems reasonable that public satisfaction should increase with increasing attention to objective planning. It is conceivable that the personal satisfactions of Board members might decrease as programming includes less and less political flexibility. Possible reasons for the decreasing trend of appraisals by road department employees are not evident.

*Summary.* — Considering the apparent degree of conformity to functional groups of characteristics in relation to subjective appraisals of effectiveness in the six counties, some trends were indicated. Trends of positive correlation with the public appraisals were apparent for the over-all characteristics of sound administration, directing and planning. Trends of positive correlation of Board member appraisals with the degree of conformity to the organizing and directing groups of characteristics were apparent. The appraisals of the supervisory personnel generally increased with increasing con-

formity to the directing and coordinating groups of characteristics. Appraisals of non-supervisory personnel generally increased somewhat with increasing conformity to the coordinating group of characteristics.

It should be noted that more negative than positive correlation trends were apparent. Where negative trends were observed, possible reasons were offered. The effectiveness appraisals used in this study generally reflected personal satisfactions, important to be sure, but any relevance of these functional groups of characteristics to work accomplishment and efficiency, objectively measured, remains to be tested.

#### EVALUATION OF METHODOLOGY AND GENERAL APPROACH

The introduction to this paper commented on the lack of direct approach to a definition of the essentials of effective local road management and proposed that a model approach, as used in other areas of research, might be fruitful. The study reported in this paper represents an early effort to apply a model approach to research in local road management. Although the study offers no conclusions for effective management, this section of the paper is an attempt to evaluate several aspects of the methodology and, in light of experience gained, to comment on likely strengths and limitations of a model approach for future research in local road management.

#### *Methodology*

1. *A Hypothetical Model — Compilation and Helps for Revision.* — Though this study did not provide an adequate evaluation of the primitive model, a functional framework is believed to have provided a useful guide for abstraction. Within this framework, a number of weaknesses in individual characteristics became apparent while attempting to evaluate the extent of conformity in the several road departments. These weaknesses included:

- (a) Generality in statement; several characteristics provided an in-

- definite basis on which to judge extent of conformity.
- (b) Reference to personal attitudes in characteristics; for example, the extent to which an organization plan is "considered sacred" is difficult to appraise.
  - (c) Conflict in concept between two characteristics in same functional group; this occurred in staffing group and was discussed earlier.
  - (d) Ambiguity in statement; a statement that "staff members are working near the top of their abilities" was intended to reflect full use of talents but question based on this characteristic was at times interpreted to be an inquiry as to productivity.
  - (e) Basing a number of characteristics on an assumed functional breakdown of responsibilities at division head level; smaller counties had geographical breakdown.
  - (f) Compound statements; some characteristics were so broad in concept that a road department could conform to one part and not conform to another.

Experience indicated some areas where a combination of overlapping characteristics would have been desirable.

The researcher may well be concerned that this primitive model contained so many characteristics that even with improved methods of testing, it would be difficult to distinguish between wheat and chaff. Though an ultimate goal is to develop a model with minimum detail, it seems more advisable to be burdened early with some chaff in the wheat than to, by over-abstracting, omit characteristics which may be relevant.

Some characteristics among the groups used in this study can be criticized as being superficial. In an effort to define relationships in administration and management, some products of the relationships received little attention. For example, the only criteria in rating policy

were apparent existence, definition and understanding; neither scope nor content of policy was considered.

While the compilation of a verbal model is but a first step in a model approach, improvement of the model is a primary and continuing concern. While correlative testing can provide quantitative evidence to guide the researcher, the process of revision can use whatever qualitative information may be obtained. Though desirable revisions in the primitive model are not discussed in this paper, one technique used in this study tapped a helpful source of ideas. During each interview with road department employees (other than road commissioner) open-ended questions were inserted at intervals. At the close of questions pertaining to a particular functional group of characteristics, each person was asked "Do you have any suggestions for improving (*function*) in the road department?" Though the employee was not advised of the characteristics on which the interview was based, answers to these open-ended questions tended to confirm the desirability of some characteristics and, in some instances, suggested areas of concern not covered by existing characteristics.

Another possible guide to model revision was not used in this study. It might have been helpful to ask each road commissioner to rate the degree of conformity or non-conformity of his department to each of the characteristics. These ratings might be of some assistance to an outside rater but, more important, they should help prepare the road commissioner to answer the questions—"If there is lack of conformity, do you think that closer conformity would be desirable? Why?" While answers to these questions would not provide a valid test of the model, they should aid considerably in early revisions.

2. *Evaluating the Extent of Conformity with Characteristics.*—By interviewing several persons at several levels in the organization structure, many opinions and impressions gained were quite different from what would have been learned from extensive contact and dis-

cussion with only the road commissioner. From experience gained in this study, the general pattern of interviewing seemed satisfactory though a larger sample within this pattern would have been helpful. An alternative to more extensive interviewing might be follow-up contact and observation with several individuals in the smaller sample. Whether increased breadth or increased depth of inquiry is the more valid approach, some observation seems highly desirable. For example, interview impressions concerning the availability of cost records may indicate that some records exist—but the nature and amount of use of such records remain essentially unknown.

Considering that, in this study, only 2 to 3 days were available for contact in each county and considering that many of the hypothetical characteristics refer to personal interrelationships, the maximum possible breadth of interviewing was chosen. Though observation was almost nil, this breadth-at-the-expense-of-depth approach seems, in retrospect, to have been a valid investment of the available time. With 100 percent more time available in each county, and appreciating the desirability of yet broader interviewing, it is believed that this extra time could best be spent with follow-up observation in company with several of the persons interviewed. Observation may be the only approach to an analysis of where what decisions are made. The "jotting" of decisions made and referred, as used in this study, reflected the bigger decisions but seemed to miss any little decisions made at upper levels; because of this, a rating on organizing characteristic 19 was not attempted.

With many of the characteristics, the degree of conformity or non-conformity of one or more counties could not be appraised. The rating of "2," intended to represent middle ground between conformity and non-conformity, often became a catch-all when evidence or definite impressions were lacking. Quantitative or qualitative improvements in evidence from either broader interviewing or an opportunity for observation would be likely to move such ratings

toward either conformity or non-conformity.

Interviewing experience in these six counties suggested a number of ideas for needed improvement in technique. For example, when designing a set of interview questions for "supervisory personnel responsible directly to road commissioner," the author had certain verbal abilities in mind. When it developed that a particular individual's verbal abilities were limited, some on-the-spot revisions were necessary. The very process of elaboration by the interviewer may well have indicated what answer he was looking for and a few employees seemed willing to satisfy. Even ignoring the tendency of an interviewer to explain and elaborate, the wording of some questions may have too often reflected the "right" answer; more indirect questions with less obvious answers would have been desirable.

3. *Appraising Management Effectiveness.*—Shortcomings of an opinion survey as an appraisal of management effectiveness have already been discussed. The indications of personal satisfactions, employee morale, and perhaps the appraisal of the personal relations factor of effective management may be helpful to the researcher but an objective measure of management effectiveness is needed. Important as the state of personal relations may be, personal harmony of road department employees must be considered only as a possible desirable accompaniment to accomplishment and efficiency.

It is possible that the concepts of work accomplishment and efficiency may be combined into some index of economical performance. Such an index for rural roads might include the mileage, an average condition or sufficiency rating and an average traffic volume (as indicating probable construction and maintenance standards) for the system. While these factors would indicate generally the work accomplishment or output, the introduction of total expenditure over a period of time would reflect the efficiency of operations. In evaluating accomplishment and efficiency, it is apparent that

environment of operations should be considered. Environmental factors are numerous but climate, topography, soils, and number of stream crossings may be important concerns.

Assuming that a valid measure of management effectiveness can be obtained, another hurdle remains. Is the management that exists today essentially the same management that existed during the period of appraised effectiveness? Perhaps present management is in reality effective (if it could be measured); but having inherited a "sour apple," any evaluation over a time span is likely to suggest ineffective management. Conversely, some "golden apples" may have been inherited. Since a pattern of management is not likely to have remained static over a period of years, appraisal of effectiveness over a time span may well not be a reflection of present management. A more instantaneous measure of effectiveness would be desirable but accomplishments and costs over a short time span are less likely to give a reliable index of economical performance.

Scott (9) has proposed that relative performance of road departments may be appraised by a study of distribution of expenses. One suggested basis of comparing counties is a ratio of the total cost of administration, equipment, and labor—to the cost of materials used. Such an approach might helpfully reflect efficiency of getting materials on the roads but it would not seem to reflect the quality or adequacy of work accomplishment.

Kennedy (10) has suggested that annual road expenditure per vehicle mile of travel might be one criterion for comparing performance in areas of similar climate, topography and geology. Though vehicle miles of travel would suggest what the average geometrics and other road characteristics should be, some measure of road sufficiency would seem necessary if actual work accomplishment is to be reflected.

Though an objective, valid, and simple approach to the measurement of over-all management effectiveness is not presently apparent, such a measurement ap-

pears to be the information most needed for a direct approach to the study of local road management.

4. *Testing the Model.*—The method used in this study for appraising a hypothetical model included only an inspection of apparent relevance of functional groups of characteristics. As improvements in methodology permit a more valid testing of relevance, attention to individual characteristics would be desirable. In considering relevance of individual characteristics, a larger sample of road departments would probably be necessary. Needed enlargement of the sample could be guided by the range in management effectiveness provided by an original sample and observations concerning influences of size of department.

As tests for relevance, combined with experience, suggest improvements in functional concepts and individual characteristics, more advanced tools of statistics may suggest relationships which will improve understanding of the management organism and improve the usefulness of a model.

### *The Approach*

An evaluation of a model approach to research in local road management cannot be based on answers which this study has provided. Yet the experience gained in this exploratory study suggests both likely strength and some limitations of a model approach.

*Likely Strength.*—A model approach is, in fact, the scientific method. Much research in this field has traced the early steps of the scientific method, the observing and theorizing—but has stopped short of testing. A model approach gives free-rein to the processes of observing and theorizing, but imposes a requirement that theories or concepts must be tested before they are offered as principles. With some modification, the characteristics compiled for this study might have been published as "A Check List for Effective Local Road Management" but the discipline of the scientific method helpfully asks if relevance has been demonstrated.

While the statistical tools of a model approach may well help to weed the irrelevant from the essentials, the approach provides more than shrinkage of a preconceived model. Each test of a hypothetical model in operating road departments can bring back evidence concerning adequacy or inadequacy of the model, coupled with more experience, which should make for progressive improvements in subsequent models. While the goal of a model approach is to derive the essential characteristics of effective local road management and a better understanding of the management organism—even as a model fails to predict management effectiveness, it provides a helpful framework for investigation.

*Limitations and Possible Dangers.*— Experience suggests some limitations and possible dangers in a model approach. The validity of an evaluation of hypothetical characteristics can be no better than the validity of a measurement of management effectiveness. An inadequate measure of effectiveness, if its inadequacy is not realized, may be misleading. Though subjectivity is perhaps an inescapable earmark of management research, it must be considered as a limitation in any research approach. Even as an appraisal of management effectiveness can be approached objectively, a determination of the extent to which a road department conforms with hypothetical characteristics is colored by personalities and bias. Another limitation, the approach does not provide an objective evaluation of a characteristic or group of characteristics to which all road departments in a sample happen to conform (or not conform) in the same degree.

Although the correlation tools can be of help to the researcher, they can also be misleading. Statements concerning cause-effect relationships based only on correlation may be tempting—but dangerous. Always a problem in a model approach is a tendency for the researcher to become attached to his model. It is not easy to begin a study with a preconceived notion and avoid completely the dangers of a closed mind.

#### SUMMARY

The purpose of this study was to explore the possible application of a model approach to the study of local road management. A first sequence in a model approach, the compilation and testing of a primitive verbal model, was attempted. Though some problems in methodology, especially the lack of an objective measure of management effectiveness, prevented a valid appraisal of the primitive model—the experience gained in this study may be helpful in future research. With development of adequate method, a model approach may be a promising path to an ultimate definition of the essentials of effective local road management.

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## APPENDIX

A HYPOTHETICAL MODEL: CHARACTERISTICS OF A WELL-MANAGED  
LOCAL ROAD DEPARTMENT

- I. Sound Administration as Affecting Management
  1. Existence of defined and understood objectives and policies.
  2. Appointment of a qualified department head, desirably an engineer.
  3. Delegation to the department head of the authority "to manage" with little or no residual pressures concerning hiring of personnel, methods of work, etc.; authority of department head is on par with responsibility he has accepted.
  4. Political responsiveness exists (without bowing like a tree in whatever direction the wind may be blowing). Public relations include:
    - a. learning about public desires and aspirations
    - b. advising public what it should desire
    - c. insuring satisfactory contact with the public
    - d. informing public about accomplishments and plans
  5. The board seeks and uses factual information and counsel from the department head as a guide to administrative decision.
  6. The interests and thinking of Board members are coordinated so that relationships with the public and

especially with department head *are as a Board*.

7. The Board checks on results.

## II. Effective Management

### A. Organizing

1. An organization chart exists or, if not, one can be readily sketched by the department head.
2. The organization chart offered by the department head, especially at the upper level, can be sketched by all division heads.<sup>1</sup> Division heads can chart the organization of their division.
3. The organization plan is not considered sacred; it has been or will be changed as considered desirable.
4. Organization planning has started with activities necessary to achieve objectives (rather than being built completely around personnel readily available).
5. The grouping of activities into divisions reflects similarity of function or need for intimate association.
6. Each division represented in top management (responsible directly to the department head) contributes directly to primary objectives of the department or to the objectives of more than one other division.
7. The effective span of attention (control) of the department head is not exceeded; he has sufficient time for over-all management.
8. The span of attention for division heads is realistic; supervisory personnel at all levels are not responsible for more than they can adequately control; yet no division (or subordinate group)

could be combined with another division (or subordinate group) without exceeding the practical span of attention of one person.

9. Considering the activities or grouping of activities selected for division status (person in charge responsible directly to department head), a high degree of coordination is necessary. The several division heads have need for intimate association. Even at lower levels, the organization chart reflects who-needs-to-talk-to-whom-how-often-about-what.
10. The selection of activities or activity groupings as divisions is such that individuals required to head divisions are likely to be compatible intellectually and socially — and are likely to earn similar salaries.
11. The organization or re-organization of a particular division is planned largely by the division head; this is reviewed, however, by top management (department head and other division heads) in the interest of balance and the possibilities of shared manpower.
12. The organization pattern reflects a balance between “not too many levels which complicate communication” and “not too broad a span of attention which hampers control.”
13. There exists little or no tendency to go through channels rather than directly to the man who has needed information.
14. Dual subordination does not exist; there is no confusion concerning authority and informational relationships; central office or other service

<sup>1</sup> The term “division head” refers to supervisory personnel responsible directly to the department head.



- staffs have not become "staff empires."
15. Authority, responsibility, and relationships of individuals and groups are defined and understood; authority and responsibility are in balance.
  16. There is little or no duplication in efforts of the various divisions or groups of the road department.
  17. There has been considerable delegation of authority within the road department — but not exceeding capacities of staff; the department head is not making decisions which subordinates can and should make.
  18. Each individual understands what decisions he makes and influences to which he is subject in making each of these decisions. There is very little "buck-passing." Delegation of authority consists of more than assignment of duties; it confers discretion on others to use their judgment in meeting specific problems within the framework of their duties.
  19. Decisions are made as close as possible to the scene of action; yet decisions concerning efficiency vs. adequacy are made where both may be seen in perspective. Periodic or recurrent decisions are not made "near the top"; decisions made near the top reflect:
    - a. futurity
    - b. impact on more than one division
    - c. values (other than factual)
    - d. rareness or uniqueness
- personal qualification; there is no indication of staffing by political patronage.
2. A merit system exists to protect personnel from political "whim" and encourage continuity of effort.
  3. Salary levels are on a par with like responsibilities in private employment and competing jurisdictions.
  4. The salaries of division heads do not vary widely — nor are salaries of individuals in this group considerably less than the salary of the department head.
  5. Within the department, individuals with similar skills, experience, and responsibilities receive approximately equal salaries.
  6. In hiring new personnel, especially at the operating level, the individual under whom that person would work has a voice in the selection.
  7. As problems of supervisory staff replacement arise, subordinates at next lower level are consulted as they may share in leadership selection.
  8. Staff members are working near the top of their abilities; the job requires "the best in him."
  9. Though formal authority may be delegated to an individual, the real source of downward authority is acceptance by his subordinates and the real source of upward influence is respect by his superior. To this end, effective staffing is reflected in respect by immediate superiors and acceptance by immediate subordinates. (Fitness report included rating of: work accomplishment of group supervised, efficiency, control, planning ability, leadership, judgment, coop-

## B. Staffing

1. The selection and promotion of staff is on the basis of

eration, development of subordinates, initiative, dependability, professional or technical qualifications.)

### C. Directing

1. Direction at all levels is more than the giving of orders for commands. Consider three common techniques of direction or supervision:

- a. Autocratic (boss advises what and how, using only his own resources)
- b. Consultative (boss encourages maximum participation by subordinates; uses resources of all though not committed to adopt suggestions)
- c. Free-rein (boss serves as coordinator of information and as a teacher; most decisions made by subordinates)

Direction in the road department, assuming adequate staffing, tends to center on the consultative approach which fixes authority but takes advantage of maximum resources.

2. Direction is by mutually recognized objectives rather than by domination; effort is focused on what the job rather than what the boss demands. There is a definite awareness, at all levels, of over-all department objectives as well as specific job objectives.
3. The man who does the work shares in its planning; employees at all levels consider that they have full opportunity to "stand up and be counted"; the employee feels that his opinions and sug-

gestions are welcomed and considered helpful; he understands the environment of a decision affecting his course of action.

4. Where a decision is to affect the efforts of more than one individual, a group conference technique is used rather than a series of "man to man" contacts.
5. The teaching of subordinates and provision of necessary information has replaced a need for constant exercise of authority or advice.
6. Whether or not the worker wants responsibility, it is demanded of him. He feels that his job is challenging and includes some element of skill and judgment. Even though it may not be completely true, the worker considers that "on this job, something new is always cropping up."
7. Supervisory personnel at all levels have a marked interest in subordinates as individuals. Supervisory personnel consider that their role is derivative and subordinates sense this philosophy. The boss considers that he exists to help others do their job rather than to "see that they do it." In discussions of accomplishments the boss consistently uses "we" rather than "I." Workers consider that their best efforts and accomplishments are appreciated.
8. Supervisory personnel at various levels have sufficient time for communication upward; work progress of subordinates seems to take care of itself.
9. Supervisory personnel do not exert personal direction of individuals responsible directly to their subordinates.

#### D. Coordinating

1. Management at all levels realizes that coordination must be achieved through interpersonal, horizontal relationships of people. Informal communication exists within and between divisions.
2. In recognizing that personal contact is the most effective means of coordination, group meetings at the division head or even at lower levels are used. Coordination is promoted not by telling subordinates what is to be done; unity in objective is achieved by permitting members to share their needs, problems, observations and suggestions.
3. Divisions are pulling together; division heads do not consider that any particular division or group is a favorite of the department head or has received preferential treatment. There exists a balance of effort without evidence of "empire building" within the department. Division heads consider that other divisions are aware of their needs, cooperate with them fully, and that all division heads are looking at the same dominant goal.
4. Division heads consider that their influence on the department head is as a group; they consider that they are a part of top management.
5. Manpower and equipment are shared between divisions as necessary.

#### E. Controlling

1. The control methods adopted provide means for assuring that results will be satisfactory but include a minimum of detailed oversight.
2. Physical and/or monetary standards have been estab-

lished so that an individual knows if performance is satisfactory.

3. Those performing the work have had a part in developing the standards. Those concerned with living within a budget have had a hand in planning the budget; it is considered to be as much a personal commitment as a tool of limitation, externally imposed.
4. Records and reports are considered essentially to be the tool of the man who fills them out rather than solely as an instrument of control from above; records and reports are considered to be useful and not merely "busy-work" by the man completing them.
5. The budget is sufficiently detailed to definitely reflect organization pattern; it is sufficiently detailed to provide control of division activity and specific projects — but not of such detail that it makes some flexibility impossible.
6. Accounting service is more than an audit for honesty, it indicates to the man directly concerned how expenditures are conforming to budget plan; reports reflect encumbered funds as well as monies actually spent.
7. The accounting service also provides cost analyses which guide control standards as well as planning.
8. In the absence of intimate contact with the work, reports are provided to the immediate supervisor so that he is aware of how progress conforms to plan.
9. Regardless of more formal systems of control, there exists first-hand observation of accomplishment, and per-

sonal contact of the department head with people on the job; this is not interpreted as meddling but is considered to reflect an interest in work progress.

## F. Planning

1. Policy planning, based on value judgment, is the responsibility of the Board; within the framework of this policy, program planning is the responsibility of the road department. Program planning is based on fact and objective estimates; it is not dictated by political expediency.
2. Although adaptivity to existing financial resources is a must, planning looks beyond to actual needs. Although it must, of necessity, consider "what can we pay for it?", planning centers on "what are our needs?"
3. Planning, with its thinking and analyzing, is not slighted under pressure of action decisions; the focus is ahead.
4. Planning looks backward to past experience — as well as ahead to needs or expected needs; since planning requires "memory," records exist and permit memory to be drawn upon as needed. Records include: earnings of equipment, road maintenance costs, road construction costs, road inventory, road use information, an index of road sufficiency, and population trends and distribution. Such records contribute to objective decision concerning: equipment purchasing, system classification, design standards, balance of construction and maintenance, and priority for road improvement. Planning is by "instrument panel" rather than by "seat of the pants" intuition or hunch.
5. Criteria of efficiency influences planning decisions; public funds are not spent unless there is assurance of "profit"; alternatives which produce largest result for a given application of resources are given first priority.
6. Budgets are more than "eyed-in." All levels in the road department participate in facilities planning by enumeration of internal needs and consideration of financial resources. Budgets, and reflected work program and facilities improvements, are planned from the bottom-up rather than imposed from the top-down. Decision is located, though, where it will be of necessity approached as a question of efficiency rather than a question of adequacy.
7. Planning reflects balance of effort; balance is encouraged by coordination in early stages of planning.
8. Long range planning and yearly planning are concurrent; yearly plans are "in tune" with long range goals and objectives.
9. There exists a "middle of the road" balance between flexibility and inflexibility in planning. Planning and budgeting are sufficiently inflexible that management is not forced to act solely on the basis of public pressure or present phenomena — yet sufficiently flexible that deviation in an emergency or for other objective reason is possible.