

UCI-ITS-WP-78-9

**The Effect of Organization Size and Structure on
Transit Performance and Employee Satisfaction:
Intermediate Progress Report**

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December 1978

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This paper is part of a research project entitled, "The Effect of Organization Size and Structure on Transit Performance and Employee Satisfaction". Support for this project is being provided by the U.S. Department of Transportation, Urban Mass Transportation Administration, Office of Policy Research, under contract #CA-11-0016.

Although there seems to be a widespread belief that the performance of a transit property is related in some way to the manner in which the property organizes the relationships of the people working in it, very little experimental work has been done to investigate the nature of this relationship. A standard feature of management audits performed by consulting firms is some modification of the existing organization chart. But there is little justification for these changes because there is little experimental evidence in the area, especially related to transit organizations.

The Institute of Transportation Studies has undertaken a year long study aimed at increasing our knowledge of organizational structure in the transit industry and its relationship to performance and attitudes of employees. This report is a preliminary discussion of the results. Analysis of the data collected in July of 1978 has not been completed so the conclusions and interpretations put forth in this report must be considered tentative and subject to change. The following discussion will be based on the interviews with general managers of the transit properties visited. It will attempt to incorporate some of the more subjective impressions and less quantifiable information contained in the interviews.

This study collected data from 16 transit properties in California. The sample includes a representative cross section ranging in size from 21 to 837 buses and from 50 to 2000 employees and includes a variety of service areas, population densities and types of operations. In all but one case, the general manager was interviewed by the researchers.

This report is divided into three sections based on the information obtained in the interviews and subjective impressions of the interviewers: structural variations, factors influencing structure, and uses of structure by management. Although the research project studies attitude and performance in addition to structure, the attitude and performance data is still being compiled and analyzed at this time. Consequently this report will be concerned primarily with structure and its components.

STRUCTURAL VARIATIONS

This research focuses on the following dimensions of structure: size, subunit size, number of specialties, vertical span, administrative intensity, formalization, standardization, and centralization.¹ Overall size appears to be a major determinant of most of the other structural variables. As the size of the organization increases there is a tendency to have larger subunits, a greater number of specialties, a larger vertical span, more formalization, and more standardization. Although the administrative component grows with larger organizations, there is some suggestion that the administrative intensity may not increase as well, that is, the proportion of total employees that is concerned with administrative functions may not increase with size. The degree of centralization of decision making authority appears to vary substantially and does not appear to be directly linked to size of the transit property.

¹ Definitions of these dimensions appear in Appendix A. For a more thorough discussion see The Effects of Organization Size and Structure on Transit Performance and Employee Satisfaction: Preliminary Research Report. Report No. CA-11-0016-1, Institute of Transportation Studies, University of California, Irvine, 1978.

Overall size is a unique structural characteristic. Aside from the fact that it affects many other structural characteristics as well as operations in general, there is an attractiveness about size that pervades the industry. There is a widely held belief that small transit properties can be combined into a larger, more effective operation. In addition, there is in the transit industry, as in most public organizations, the tendency to equate status with size of operation. Larger organizations have bigger budgets, employ more people, and enjoy a higher status in trade associations. One of the results of these beliefs is a pressure to grow and expand operations. Size is increased often with little consideration of the effects on the internal workings of the organization, the attitudes of the employees, and in some cases performance itself. Thus, the relationship between size and performance tends to become confused. As was shown in the Preliminary Research Report, we expect very little firm evidence of a relationship between size and performance. Since performance is only one of the considerations in decisions about size, the relationship may be difficult to identify.

Another source of apparent variation is size of organizational subunits. There appears to be significant variation in the number of subunits, the types of subunits and the relative size of the subunits. Since buses are the mode of transit in the properties studied, it is not surprising that operations and maintenance subunits are found in all properties, and that these subunits are the center of the organizations. The variations occur with the additional subunits. As size increases the number of subunits

increases. There is also variation in the type of subunits that appear in different sizes and the relative importance each holds in the organization. For example, the smallest properties operate with three subunits: operations, maintenance, and the general manager's office. Slightly larger organizations add a subunit. In some cases it is concerned with finance or accounting. In others, it is concerned with personnel. The larger properties tend to have five major subunits: operations, maintenance, finance/accounting, personnel relations, and planning. The relationship among these subunits varies with the properties. Some seem to emphasize finance over personnel and planning, others have large personnel departments, and others have large planning departments. These variations are not random. The organization of each property appears to be related to the environment in which it operates and the perception of top management of the role of transit. More specific analysis of this awaits processing of the data collected, although the nature of subunits will be discussed again later in this report.

Number of specialties, in many ways a correlate of number and size of subunits, also increases with size of organization. In general, a specialty is created as sufficient need is perceived. The types and number of specialties reflect the perceptions by management of the most pressing needs in the organization. Presumably, if an organization has a large planning and research department and has a smaller personnel department, this is an indication of the relative importance of each in the eyes of the general manager. In comparably sized organizations we may find almost

the same number and types of specialties. Yet the way they are organized and the relative importance of each varied significantly between the properties.

Variations in the number of specialties also reflect management philosophies. Some managers believe in a "lean" administrative component and will tend to reduce the number of positions in the organizational hierarchy while others prefer a more highly developed and formal hierarchy and tend to have more specialists. We may be able to say more about the efficacy of these approaches after complete analysis of the data. At this point it is possible to say that variation does exist and is probably related to employee satisfaction.

Vertical span tends to increase with size. However, there are other factors which tend to impact the number of levels in a transit property. Two of the most obvious are geography and politics. Some transit properties service a relatively compact area. Others service areas that comprise two or more distinct regions. This distinction may be in the form of geographical separation (natural barriers or tracts of less populated land separating population centers) or political boundaries which make it expedient to separate the service area into components. Therefore, we can find an extra level in the hierarchy devoted to making this distinction. As a broad statement, it might be said that the number of vertical levels will increase as the geographical or political environment becomes more heterogeneous.

Administrative intensity has several interpretations. The two most useful in this study appear to be (a) the proportion of employees not directly engaged in operations or maintenance, and (b) the proportion of employees in managerial or supervisory positions. The first approach is concerned with the relative size of supportive component compared to the line component (directly involved in providing the product or service). Theory suggests that administrative intensity should decrease with increased size, although research has not supported this strongly. The transit properties examined in this study show no definite trend in administrative intensity with respect to size.² There may, however, be a three way interaction between size, administrative intensity, and performance as measured by the indicators.³

Preliminary observations suggest a substantial variation in the proportion of management to total employees. This may be associated with the management style of the general manager. Some managers may intend to keep the managerial component small as a way of maintaining more personal control of operations. Others may see a larger managerial component as a method of distribution of authority or decentralization. Each style has merit. Although many factors influence performance, the relationship of

²Section 1 and Table 1 of the Preliminary Research Report for this Research Project reviews the literature.

³The performance indicators used in this study are presented in G.J. Fielding, R.E. Glauthier and C.A. Lave; Development of Performance Indicators for Transit. Report No. CA-11-0014-4, Institute of Transportation Studies and School of Social Sciences, University of California, Irvine, 1977.

of proportion of managers to performance may prove enlightening.

Formalization, standardization and centralization have been assessed primarily through the questionnaire. Therefore, this report will not attempt a discussion of these dimensions other than to note that the lines of authority and job scope are more definitive in some properties than others.

FACTORS INFLUENCING STRUCTURE

A critical factor in the development of structure in transit properties is the general manager. In most cases he is the person designing and instituting structure in the organization. Therefore the personality, abilities, interests, and management philosophies of the general manager weigh heavily on the type of structure found. This is especially true in properties that have experienced rapid growth in recent years.

In a small transit property as in any small business, the general manager will perform most of the administrative tasks himself, often on an informal basis. Financial decisions, planning decisions, and personnel decisions can all be made by one person because the decisions themselves are generally less complex and there are fewer of them. As the property grows, it becomes increasingly difficult for one person to perform all the administrative functions. At some point the general manager finds it necessary to expand his administrative staff and delegate some activities. At this point the effects of individual differences on the type of structure become apparent. Some managers are capable of handling larger operations singlehandedly. In these cases a smaller administrative com-

ponent and a very centralized operation is likely. When the general manager does delegate authority, he often will set up departments for decisions in which he either has less expertise or interest. Thus one property might develop a finance department and another might develop a personnel department because the respective managers prefer to delegate those decisions to others.

Management philosophy also plays a role in defining structure. At one extreme a manager might feel the need to keep tight control over the activities of a property and develop a very centralized structure in which almost all decisions of consequence are made at the top even though there may be a rather large administrative hierarchy. At some point this style would become dysfunctional to the organization. The general manager would be inundated with decisions and his subordinates would feel unable to act. Smaller organizations can function this way but extreme centralization of this nature will create problems in larger organizations, although the size at which this becomes a problem is unknown. At the other extreme, a manager may attempt to develop a "participative management" style. He might delegate as much decision making as he could and attempt to coordinate the property through meetings and increased communication. At the extreme this style also can be problematic. High decentralization makes the institution of a consistent policy more difficult. Integration is essential. Much of the time and efforts of managers may be consumed keeping each other informed or departments may begin to operate at cross purposes.

In the present research we found properties which approached each of the extremes. One large property displayed a degree of centralization in decision making that created management problems and another property had subunits operating so independently that a common complaint was one department's decisions created difficult or impossible situations for another. Neither of these situations can be beneficial for performance.

Management philosophy impacts the organization chart through the relative importance of subunits. Some of the properties have large planning and marketing departments which reflect the belief that marketing is the key to successful transit operations. Others put increased emphasis on finance or personnel reflecting a view that these departments are critical.

Because he is usually given freedom to administer the business aspects of the property and because there is such a variety of personalities heading these organizations, the general manager emerges as one of the most important determinants of organizational structure.

Relationship with Governing Body

Twelve of the sixteen properties visited in this study have a Board of Directors or Supervisors to whom they are responsible. The other four are departments within city government (municipal operations). This alone has a substantial impact on the structure of the properties. Those that are part of the city government are distinctly different: much of the administrative activities are done in other parts of the city government. Accounting, purchasing, personnel and planning activities may be done by respective city departments. This reduces the need for administra-

tive staff in the property. It also reduces the property's decision making freedom and leads to complaints of lack of responsiveness by other departments. Personnel replacement, for example, often takes a longer time and may not be done proficiently because the personnel department does not have expertise in transit recruiting.

Since the transit property is only one of several departments (twelve in one case), the attention of top city officials who make many of the critical decisions is focused on many diverse issues. Transit problems are among several items on their agenda and may not receive the amount of attention the transit property desires. Additionally, the transit department head can be caught in a difficult position: city management assumes (and may neglect) policy making authority and most operational concerns are handled by his subordinates. In at least one case, the transit department head was left in the middle, acting primarily as an intermediary between department and city.

Transit departments are difficult to classify as distinct organizations. They are more logically subunits of a larger organization. The outcome of this is that the interests of transit are in competition with the interests of other departments and frequently are not given sufficient attention. In some cases transit is of little interest to the city except in its ability to attract federal and state funding. Such lack of support has to be detrimental to transit. This may not have been a problem when transit was a small department, but with recent increases in size, the situation is becoming less functional.

The properties with boards appear to have more independence and freedom of action. However, the relationship between boards and management is not well defined. The researchers encountered a wide range of interactions from direct involvement in daily operations to approval of policy recommendations by management. In all cases there did not appear to be a clear understanding of what the role of the board should be. The board is seen as a policy making body but there is little feel for how this should be manifested in the relationship between board and management. This research should help but much more needs to be done to clarify board/management relationships. Additional research would be valuable to both the scholar and the practitioner.

While some managers would prefer little board involvement, the interests of transit are best served when the board actively pursues the role it is given. But, what is that role and how should boards operate? Some boards interact solely with the property itself as an evaluation of staff proposals. Others are more actively involved in the interactions between the public and the property and propose new policies.

Some variance is explained by the composition and selection of the board. Elected board members tend to be more actively involved in all levels of transit operations. Appointed members tend to be more content with the policy decisions leaving operations to the managers. In addition, representation on boards varies. Often there are members actively representing special interest groups: cities within the transit district, elderly citizens, handicapped or others.

One of the ways that the boards vary their involvement is in the number and types of committees they have. Some have none. Others have a finance committee and perhaps a community relations committee. The most active will have several more. The committee structure involves more two way interaction on the issues and keeps the boards better informed. The potential is always there for the board to be too involved, adversely affecting the performance of the property. One general manager expressed the opinion that management should provide the expertise and the board should provide input as to needs and assessment of management activities. He may be right, but with so little research nothing can be stated with confidence.

The role of the board and its relationship with the operation of the property has emerged as one of the areas that deserves more attention. Opinions expressed upon appropriate roles usually reflect a person's position rather than empirical evidence.

Interactions with Other Organizations

Two entities that figure prominently in transit are the state and the federal governments. Many properties owe their recent growth or their very existence to the commitments that these bodies have made to transit. Not surprisingly a great deal of attention is paid to the demands of each in order to qualify for funding. Some properties have developed subunits devoted to funding and grants. Others have created departments like accounting or planning to obtain certification where otherwise these

functions would not have been isolated. Finance departments spend a good deal of time developing and maintaining the bookkeeping required by state and federal agencies. In sum, a major portion of the energy of transit management is directed towards accommodating these agencies.

The above is perhaps the most obvious example of "institutional management" or the focus of management attention outside the property. Clearly the structure of all transit properties is influenced substantially as a result. Other organizations that impact on transit include special interest groups such as the handicapped, the elderly and schools. The degree of impact varies with properties. The federal proposal that buses be fully accessible to the handicapped is presently affecting transit properties. Capital investments are being delayed and financial plans are made conditional to the federal decision.

There was also a rather strong feeling among general managers that some of the legislation of the state and federal governments is at cross purposes. For example, the federal government subsidizes transit operations based on the shortfall between operating cost and farebox revenue. This encourages properties to maintain low fares. The state, on the other hand, limits its support of transit to a designated portion of operating costs, but in the San Francisco Bay Area, requires the property to obtain a specified proportion of its expenses from the farebox.

In addition to the problem of contradictory requirements, the managers also indicated that properties were being rewarded for inappropriate behavior. Subsidization based on deficit encourages inefficient

performance and penalizes operations that cut costs or develop economies. In this sense good management is being discouraged. With such a dependence on outside funding, there is the tendency to be more responsive to the requirements of transit funding agencies than the needs of the service area. There is a need to examine more closely the impact of legislation on the behavior of transit properties, especially the unintended consequences.

Researchers were able to identify two other relationships with other organizations that were of particular interest. One of the properties is managed by a professional transit management company that supplies management personnel to approximately 36 properties. These managers have an additional agency influencing their action. The company provides training and special services and has its own evaluation of managerial performance.

The other special relationship is one where provision of transit service is contracted to a private bus company. The governmental agency assumes a role of overseer and policy maker with operations, maintenance and personnel functions delegated to the company.

Both are interesting and innovative approaches to the problems of managing a transit property. These approaches will be monitored carefully when the empirical data is analysed.

Mode of Decentralization

Three general strategies have been identified for decentralizing organizations.⁴ The first is on the basis of territory or geography.

⁴Eric J. Miller. Technology, Territory, and Time: The Internal Differentiation of complex production systems. Human Relations, 1959, 12, 243-272.

A property may operate out of one central site or may have several sites dispersed throughout the service area. The second is on the basis of time, that is, some operations are performed in two or more distinct time periods or shifts. In the transit industry the hours of service require two shifts. Within the organization we can make a distinction based on the shift worked. The third is on the basis of technology. The same service may be provided through the use of different equipment. In transit we see this operating at several levels: There is the distinction between rail transit and bus transit, and within the bus transit there is distinction between types of vehicles (vans, small buses, standard buses, and articulated buses). The orientation of the service also varies: fixed route differs from demand-responsive service in terms of service objectives and methods and may provide the basis for decentralization. Structural characteristics such as vertical span, number of specialties and administrative intensity will be affected by the mode of decentralization. Geographic decentralization increases vertical span and administrative intensity because it creates the need for managers at each of the locations. Similarly, differentiation into shifts requires management personnel for each shift. Technological differentiation will affect the number of specialties because the organization is engaged in more than one type of activity.

Mode of decentralization also influences structure through the order of hierarchy in which the modes are employed. Some properties with distinct population centers may make the first decentralization based on geography

or territory by establishing two or more fairly independent operating locations. Others may have two locations but make the first differentiation based on time. The scheduling of drivers and routes would be done for the property as a whole not independently in each location. Still others might find the easiest decentralization to be in terms of technology or mode; separating dial-a-ride service from fixed-route and so on. Clearly, the authority structure and communication network in the organization will vary depending on decentralization. Each property will be responding to the characteristics of the community it serves. Consideration of the factors will, however, help in understanding the development of the structure of each particular transit property.

USES OF STRUCTURE BY MANAGEMENT

In general, structure as portrayed by the organization chart seems to function primarily as a descriptive tool. Management uses it in annual reports and budgets as an aid to the understanding of the organization. Most properties indicate a copy of the organization chart is available to anyone but few purposely send it anywhere. In some properties the chart is on public display, giving any visitor a view of the overall organization.

Structure is also used for more specific managerial purposes. Some properties alter structure to improve communication or to decentralize authority. Other times structure results from outside pressure. Structure appears to be a mechanism by which management reacts to the internal and external needs of the organization. However, in goal setting, structure is used in attempts to innovate or avoid problems.

Goal Setting

Goal setting is becoming a popular management strategy. The most common form is some sort of management by objectives, that is, a joint decision making process where both superiors and subordinates are involved in setting goals or objectives of each subunit. Usually these goals are set in a hierarchy where goals are factored from overall goals of the organization to goals of the subunits which in turn are factored into goals of sub-subunits and so on. Ultimately each employee would have a set of objectives which he attempts to attain. It is unusual to find an organization where management by objectives is incorporated so completely.

Management by objectives or other goal setting techniques have two criteria by which the degree of goal setting activity can be measured. The first is the goal of objective itself. To be most effective a goal must be specific, measurable, and for a specified period of time. Failure to incorporate all of these features limits the usefulness of a goal to management. The second is the use of goals. Ideally a goal is a yardstick by which performance of a unit can be judged. Evaluation is an essential part of management by objectives and goal setting. One of the benefits of the goals setting process itself is increased communication and understanding among levels in the organization.

The transit properties studied displayed a wide range of goal setting behavior. Nine of the properties visited had very little or no goal setting activity. The general manager may have been able to state some general goals but there was no evidence that these were used by management.

Two properties used goal setting to a slight degree. Goals were written in general terms but there were only minor attempts to use goals as a management tool. Three properties indicated an active use of goals in their relationship with their boards and made broad attempts to use them in evaluation. The goals were not as useful as they might have been because they lacked some of the necessary features or because their use was not widespread. Two of the sixteen made extensive use of goal setting. They developed extensive and specific goals in a participative manner and used the goals in the evaluation of the property as a whole, its subunits, and its employees. One of these adopted the complete management by objectives approach as an integral part of management.

Although the evidence on management by objectives and organization-wide goal setting is not conclusive and caution should be exercised in advocating its use, the evidence on the effects of goal setting on group performance is strong enough to encourage such activity.⁵ It is impossible to state at this time how the degree of goal setting activity is related to performance of the transit properties but this topic will be discussed in more detail in the final report.

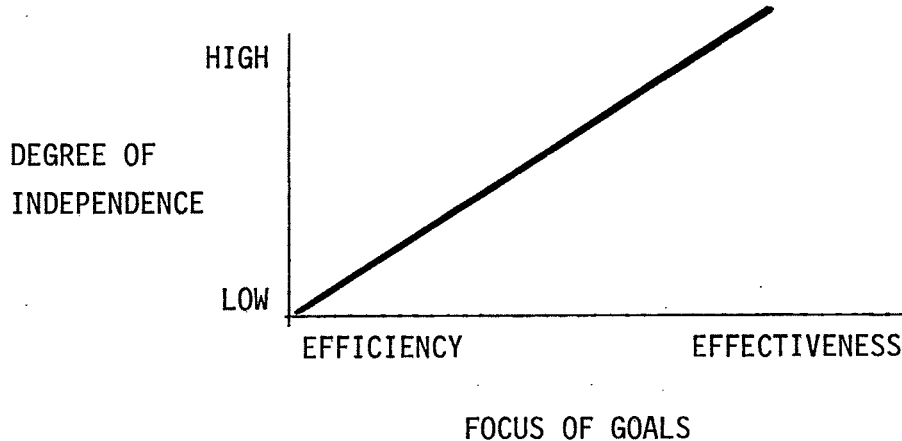
The types of goals that are mentioned provide some additional indication of the approach of management. Some properties emphasize efficiency

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Examples of the effects of goal setting on group performance are: Latham, G.P. and Yukl, G.A. Assigned versus participative goal setting with educated and uneducated woods workers. Journal of Applied Psychology, 60, 3, 299-302. Latham, G.P. and Baldes, J.J. The "practical significance" of Locke's theory of goal setting. Journal of Applied Psychology, 60, 1, 122-124.

type goals and seem primarily interested in maintaining the status quo, leveling off operations and consolidating the operation. Others develop goals related to effectiveness and display a more aggressive stance towards planning and innovation and even policy making. Review suggests that the type of goal set may be related to the relationship that is established between the board of directors or city council and transit management. It appears that the degree of independence and freedom of action that a property has with respect to its board is positively related to the concern it has for effectiveness issues in its operation. Figure 1 below illustrates the relationship suggested.

Figure 1



If full analysis supports this observation we would have evidence that the nature of the interaction of management and boards and their formal association affects performance and the focus of performance of transit properties. This would underscore the need for more thorough

examination of the role of the boards and of the degree to which transit management should have an external focus.

SUMMARY

Interviews with general managers and subjective impressions have enabled the research team to make preliminary observations concerning transit management structure. There is a good deal of variation in the structure of properties studied. The sample was selected to insure a variation in size. Most of the other structural dimensions varied as well. Several factors became apparent as influential in the development of structural characteristics. The general manager's personality, philosophy and abilities played a significant role. The relationship with the body having direct authority over the property also influenced structure of properties. The mode of decentralization influenced authority and communication structures.

Although structure was not used widely as a management tool there was some important activity with respect to goal setting. To the extent that goals were factored down the organizational hierarchy this activity made use of structure. Goal setting behavior led to the preliminary observation that the focus of goal setting on efficiency or effectiveness may be related to the relationship that is established between the property and its board. Freedom of action seems to be related to a greater concern for effectiveness as a measure of performance.

Appendix A: Definition of Structural Dimensions

1. Size:

Size is the scale of operations. The organizational literature generally defines size in terms of the number of personnel. The number of personnel is not always the best way to define the concept of size. An organization can be quite large in size, but due to a high degree of merchanzation, for example, have relatively few personnel. It would seem preferable to use the number of personnel as one indication of scale of operations. In the present study, an additional indicator of scale of operations, namely, the number of buses operated by a property, will be used.

2. Subunit Size:

The number of employees in the subunit (department, division, etc.).

3. Number of Specialties:

The number of specialties is defined as the number of different occupational titles or different functional activities pursued within an organization.

4. Vertical Span:

Vertical span is refers to the number of organizational levels or more exactly, the number of hierarchical levels in an organization.

5. Administrative Intensity:

The ratio of administrative personnel (managerial and supporting staff) to operational personnel (maintenance and operations).

6. Formalization:

Formalization is the degree to which appropriate behavior is explicit. An organization which describes appropriate behavior in written form is more formalized than one which does not. The focus of formalization is on describing what behaviors are expected. This concept is usually measured by rating of the degree to which appropriate behavior is prescribed in writing, or an actual count of the number of rules.

7. Standardization:

Standardization refers to the degree to which procedures are prescribed or defined. A highly standardized organization would explicitly define the manner in which an activity is to be done.

8. Centralization:

Centralization is the degree to which power is concentrated. In an organization, the maximum degree of centralization would exist if all of the power were exercised by a single individual; conversely, the minimum degree of centralization would exist if equal power were exercised by all the members of an organization.