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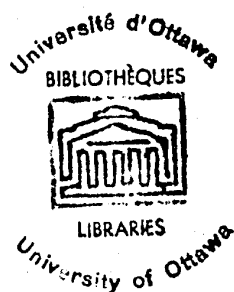
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AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES
ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE
COMPONENT OF ONTARIO SCHOOL BOARDS

by Maxwell Trask

Thesis presented to the School
of Graduate Studies of the
University of Ottawa as partial
fulfillment of the requirements
for the degree of Doctor of
Philosophy



Ottawa, Canada, 1978

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UNIVERSITÉ D'OTTAWA / UNIVERSITY OF OTTAWA
École des études supérieures/School of Graduate Studies

Title of thesis AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES
ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE
COMPONENT OF ONTARIO SCHOOL BOARDS

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CURRICULUM STUDIORUM

Maxwell Trask was born December 27, 1946, in Bonavista, Newfoundland and Labrador, Canada. He received his Bachelor of Arts in Education from Memorial University, St. John's, Newfoundland and Labrador, in 1969. He also received his Master of Arts in Education from Memorial University, St. John's, Newfoundland and Labrador, in 1972. The title of his Masters' Thesis was: THE CRITERIA FOR THE SELECTION OF PUBLIC ELEMENTARY SCHOOL PRINCIPALS IN THE PROVINCE OF NEWFOUNDLAND AND LABRADOR.

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ABSTRACT OF

AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES
ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE
COMPONENT OF ONTARIO SCHOOL BOARDS

ABSTRACT OF

An Examination of the Relationships Among the Variables Organizational Size, Complexity, and the Administrative Component of Ontario School Boards¹

The problem was to determine the relationships among the variables, organizational size, organizational complexity and administrative components of school boards.

The problem presented two questions: First, were mean administrative ratios of small-sized school boards larger than that of either average or large-sized school boards? Secondly, are the differences between mean administrative ratios of small-sized, low complexity and large-sized low complexity school boards different than that of small-sized, high complexity and large-sized, high complexity school boards?

The Aston conceptualization of organizational structure and Blau's formal theory of differentiation in organizations provided the analytical and theoretical frameworks in which to examine the questions pertaining to the variances of economies of scale in the school board administrative units.

¹ Maxwell Trask, doctoral thesis presented to the School of Graduate Studies of the University of Ottawa, Ontario, 1988p.

The specific hypotheses derived from the theoretical framework and stated in the direction consistent with the theory were as follows:

1. The mean administrative ratios of small sized school boards are larger than that of either average or large sized school boards.

2. The differences between mean administrative ratios of small sized, low complexity and large sized, low complexity school boards are different than that between small sized, high complexity and large sized, high complexity school boards.

The sample of school boards was chosen from the Province of Ontario.

The measuring instrument was the School Board Questionnaire developed for use in this study.

The data were analyzed by the Full Rank Univariate Linear Model which provided critical F-values for 3X1 and 3X3 analysis of variance testing. The following conclusions were drawn from the results:

1. The mean administrative ratios of small sized school boards are significantly larger than that of either average or large sized school boards.

2. The difference between mean administrative ratios of small size, low complexity and large sized, low complexity school boards are significantly different than

that of small sized, high complexity and large sized, high complexity school boards.

Following from these two main findings, it was concluded that various administrative components reflect different economies of scale, and that the relationship between size and administrative ratios is curvilinear.

Suggestions for further research included:

1. Replicative studies to determine whether or not such variables as expertise and the existence of two-way channels of communication affect administrative economies of scale in organizational structures.
2. Replicative studies using different samples from other types of organizations to determine if the findings of this study apply beyond the scope of this study.
3. An investigation should be conducted to determine the exact nature of the negative feedback associated with more differentiated organizations that is theorized to be the reason for the reduced productivity of the organizational size variable.

INTRODUCTION

The issue of changes in size as necessarily determining changes in the internal structure of organizations has been a persistent topic of discussion in organizational research. Unfortunately, research generally has progressed with almost no systematic exploration of the causal connection between the contextual factor of size and certain structural characteristics of organizations, specifically absolute and relative size of administrative components.

This study's purpose was to investigate the economies of scale in school board administrative units. The writer's thesis is essentially that the causal connection between organizational size and economies of scale in administration can be best understood when complexity is considered as an intricate link in the causal connection. The research centered around two primary questions:

1. Are the mean administrative ratios of small sized school boards larger than that of either average or large sized school boards?

2. Are the mean administrative ratios of small sized low complexity and large sized, low complexity school boards different than that of small sized, high complexity and large sized, high complexity school boards?

The Aston conceptualization of organizational structure provided the general parameters within which to examine the questions relating to variances in the economies of scale in administration. Specifically, the Aston framework identified the relatively homogeneous set of contextual factors that have been tested and shown to be major structural determinants.

Consequently, when these contextual factors other than size were controlled, a greater degree of specificity concerning the relationships between size, complexity, and administrative component ratios was obtained by the utilization of still another analytical tool, namely, the formal theory of differentiation in organizations by Blau. Differentiation in this study is treated synonymously as complexity, and is defined as a multidimensional concept having three major components.

Blau's theory states that increasing organizational size generates structural differentiation which creates problems of coordination and communication. The indirect negative effects of size, engendered by increasing differentiation, stems the power of additional expansions in size to make the structure still more differentiated. Hence, the effects of size are considerably less in large than in either small or averaged sized organizations.

The theory also states that the savings in administrative overhead which large scale operations make possible through the economies of scale in supervision (greater intra-unit homogeneity) are counteracted by the expansion in administrative overhead that the structural complexity (differentiation) of large organizations necessitates.

Consequently, large size tends to have opposite effects upon the administrative component. It reduces it directly and tends to enlarge it indirectly through the structural complexity that it creates.

This study was carried out in selected Ontario Boards of Education and Roman Catholic Separate School Board administrative units. These boards represented a homogeneous set of organizations which were highly congruent in the degree to which relevant contextual factors were partially or totally controlled as required by the organizational conceptualization adopted for use in this study.

Among the contributions of the study is a degree of empirical support for Blau's theoretical propositions that suggest complexity as being a judicious variable in the organizational size and administrative component ratio relationship. Additionally, the nature of the three variable relationship is partially determined by the particular definitions of administrative component employed.

The thesis is arranged in four chapters. The review of the literature, as well as the conceptualization of organizational structure and theoretical rationale are presented in Chapter I. The experimental design is described in Chapter II. An analysis of the data is provided in Chapter III. A discussion of the relationships between the variables is presented in Chapter IV along with a summary of the results and the conclusions of the study. An annotated bibliography, appendices, and an abstract of the thesis are also presented.

CHAPTER I

REVIEW OF THE LITERATURE

This chapter first presents a review of related studies dealing with the relationships of the variables, organizational size and administrative component ratios, as well as the development of a supportive component classification. Next, an analysis of growth in organizational and administrative component size is provided with a view to investigating possible explanations of present inconsistencies in related studies. From the relevant literature, a review of the importance given to the variable complexity in the organizational size-administrative component ratio relationship is provided. Central to this review is the development of multiple indicators of the concept complexity. This is followed by a discussion of the Aston conceptualization of organizational structure which provides parameters within which the study is designed. A statement of the research problem and purpose of this investigation is then advanced, followed by the theoretical rationale which forms the basis from which the research hypotheses are derived.

1. Growth in Organizational and Administrative Component Size.

The issue of size in organizational analysis has been a persistent concern in the literature and the arguments substantiating the importance of size as a major structural determinant in organizations are quite compelling. This section of the report will examine the research available on the subject of the importance of organizational size to determine what relationship it holds with absolute and relative administrative component size.

Organizations, as goal oriented, social entities, have activities which are centrally and immediately crucial for goal achievement. They are also faced with the absolute necessity of maintaining other activities which are less directly related to the attainment of organizational goals. These activities, often referred to as supportive or administrative¹, are comprised of activities such as bookkeeping, personnel administration, and maintenance services. Persons engaged in such activities comprise the supportive component of organizations.

¹ Eugene Hass, Richard H. Hall and Norman J. Johnson, "The Size of the Supportive Component in Organizations: A Multi-Organizational Analysis", Social Forces, Vol. XLII, No. 5, October 1963, p. 9.

Caplow has pointed out that the relative size of the supportive component has been the subject of considerable speculation, but a rather small amount of actual investigation². The speculative efforts are pointed up by Blau and Scott who state that there is a popular notion that "[...] large organizations tend to be over-bureaucratized, that is, an increase in organizational size is accompanied by a disproportionate increase in the administrative overhead"³. The authors further state that "the evidence does not support this assumption"⁴.

Conflicting, although not necessarily contradictory, results of empirical investigations are vividly apparent in Hass, Hall and Johnson's⁵ review of the literature.

Hass and his colleagues present the findings of various studies which reflect a lack of consistency. These findings, despite their evident incompatibilities, represent the major body of evidence in regard to the relationship between organizational size and the relative size of the

2 Theodore Caplow, "Organizational Size", Administrative Science Quarterly, Vol. I, No. 4, March 1957, p. 484-505.

3 Peter M. Blau and Richard Scott, Formal Organizations, San Francisco, Chandler Publishing Company, 1962, p. 226.

4 Ibid., p. 227.

5 Hass, Hall and Johnson, Op. Cit., p. 9-17.

administrative component. The findings are trichotomized as: 1) findings of an inverse relationship, 2) findings of a positive relationship, and 3) findings of neither a disproportionate increase nor decrease.

Few researchers have focused their attention on the relative size of the administrative component and its relation to organizational characteristics other than organizational size.

The speculative efforts as evidenced in Hass, Hall and Johnson's review are appropriate for the period up to 1963. Since then additional studies dealing with the relationship between organizational size and the size of the supportive component supplement the literature. Related research has been conducted in Canadian universities by Hawley et al.⁶, in voluntary organizations by Tsouderos⁷, in U.S. army hospitals by Tossi and Patt⁸, and in thirty

6 Amos Hawley, W. Boland and M. Boland, "Population Size and Administration in Institutions of Higher Education", American Sociological Review, Vol. XXX, No. 2, April 1965, p. 252-255.

7 John E. Tsouderos, "Organizational Change in Terms of a Series of Selected Variables", American Sociological Review, Vol. XX, No. 2, April 1965, p. 206-210.

8 Henry Tossi and Henry Patt, "Administrative Ratios and Organizational Size", Academy of Management Journal, Vol. X, No. 2, June 1967, p. 161-168.

different organizations by Hall et al.⁹. These studies generally contradict the almost universal contention that the administrative and overhead components of any organization increase out of proportion to increases in size.

Beginning in 1967, a series of related studies was conducted at the University of Alberta by Gill and Friesen¹⁰, Blowers¹¹, Holdaway¹², Lepaski¹³, and Vithayathil¹⁴. These studies generally supported the existence of an inverse relationship between administrative ratios and organizational size.

9 Richard H. Hall et al., "Organizational Size, Complexity, and Formalization", American Sociological Review, Vol. XXXII, No. 6, December 1967, p. 903-912.

10 Norman Gill and David Friesen, "Administrative Staff and School System Size", Canadian Administrator, Vol. VIII, No. 1, October 1968, p. 1-4.

11 Edward A. Holdaway and Thomas A. Blowers, "Administrative Ratios and Organizational Size: A Longitudinal Examination", American Sociological Review, Vol. XXXVI, No. 1, April 1971, p. 278-286.

12 Edward A. Holdaway and Keith A. Vithayathil, "Administrative Staff and School System Size", Canadian Administrator, Vol. VIII, No. 4, October 1968, p. 1-4.

13 William Lepaski, "Staffing Ratios and Costs in Metropolitan School Systems in Western Canada", unpublished Master's Thesis, University of Alberta, 1970, as quoted in E. A. Holdaway, "Staffing Metropolitan School Districts", Canadian Administrator, Vol. X, No. 7, April 1971, p. 30.

14 Edward A. Holdaway and Keith A. Vithayathil, "Administrative Ratios in School Systems", Canadian Administrator, Vol. IX, No. 4, January 1970, p. 15-19.

Administrative ratio, in the above-mentioned studies, was usually defined as the ratio of selected occupational types to an index of organizational size.

Holdaway voices a reservation regarding the results of these studies conducted in Western Canada,

Most studies found smaller administrative ratios in larger organizations, but there is insufficient data to permit generalizations concerning changes over time.¹⁵

As Holdaway and Vithayathil imply, these studies do not wholly alleviate all of the ambiguities regarding research findings. Certain discordant findings are still witnessed. Blowers, in his longitudinal examination of urban school systems, develops graphs for his forty-one systems which exhibited no consistent tendency to rise or fall over the five-year period of study¹⁶.

There still appear to be several critical issues in need of further investigation. Additional information is required before the following questions can be satisfactorily answered:

1. Do the various components of the total non-instructional staff of school districts reflect different

¹⁵ Ibid.

¹⁶ Thomas A. Blowers, "A Longitudinal Study of Administrative Ratios in Urban School Systems in Western Canada", as quoted in Holdaway and Blowers, Op. Cit., p. 283.

economies of scale and are these economies of scale specific to different types of districts?

2. Is the relationship between organizational size and administrative component ratios linear as many authors suggest or is it somewhat curvilinear as postulated by Holdaway¹⁷, and as indicated by Anderson and Warkov's measures of Eta² of 0.577 and 0.566¹⁸?

3. Is the linear or curvilinear relationship between organizational size and administrative component ratios dependent upon the type and number of supportive component categories included in the administrative component ratio definition?

Holdaway and Vithayathil offer partial corroboration of this writer's contention that these questions have yet to be resolved:

As an organization increases in size [...] the number of administrative personnel tends to grow. Does this growth show a linear or curvilinear form? If curvilinear, how does the gradient change with growth in organizational size? These questions have not been satisfactorily answered in the literature.¹⁹

17 Holdaway, Op. Cit., p. 31.

18 Theodore R. Anderson and Seymour Warkov, "Organizational Size and Functional Complexity: A Study of Administration in Hospitals", American Sociological Review, Vol. XXVI, No. 1, February 1961, p. 23-28.

19 Holdaway and Vithayathil, Op. Cit., p. 15.

It should be noted that most related research was of an exploratory or preliminary nature. It was designed simply to investigate the possibility of organizational size and administrative component ratios being related, and did not specifically address itself to the various points previously raised by this researcher. Additionally, the Alberta studies reflected wide variability in their different approaches. Gill and Friesen (1967)²⁰, Blowers (1969)²¹, and Lepaski (1970)²² conducted investigations of urban districts. Duboyce (1971)²³ dealt with the staffing patterns of the Edmonton School District over a twenty-five year period. Holdaway conducted a major project in 1969-70 in school systems in the seven major metropolitan areas of Western Canada, namely, Winnipeg, Regina, Saskatoon, Calgary, Edmonton, Vancouver and Victoria²⁴.

20 Gill and Friesen, Loc. Cit.

21 Holdaway and Blowers, Loc. Cit.

22 Holdaway, Loc. Cit.

23 Robert A. Duboyce, "A Longitudinal Study of Administrative Ratios in the Edmonton Public School District", unpublished Master's Thesis, University of Alberta, 1970, as quoted by Edward A. Holdaway and Robert A. Duboyce, "Development of Some Non-Instructional Components of a School System", Alberta Journal of Educational Research, Vol. XVII, No. 3, September 1971, p. 155-164.

24 Edward A. Holdaway, "Staffing Metropolitan School Districts", Canadian Administrator, Vol. X, No. 7, April 1971, p. 30.

Each of the studies conducted in Western Canada from 1967 to 1971 offers partial answers to a limited number of the posited questions. However, the studies, taken in total, do not present a complete perspective that would enable us to fully examine the inner workings of administrative component ratios. The inter-study differences appear to be too numerous to allow specific inferences relating to the posed questions. Perhaps the more immediate question has yet to be formulated and subsequently empirically investigated. The more pressing question is that of: What other organizational variables judiciously belong in the organizational size-administrative component ratio relationship?

Studies supporting either a negative or positive relationship between the relative size of the administrative component and increasing organizational size generate the following question: To what extent does the nature of the relationship between administrative component ratios and organizational size depend upon the type of organization involved and might this explain the disparate findings?

School systems, unlike business firms or industrial organizations, are non-profit organizations in the ordinary sense of strict economic or monetary gain. Thus, the marginal profit rule that is typically assumed to be an underlying explanation for variations in business

administrative intensity cannot be applied to educational organizations such as school systems. It could only be applied if the problem of marginal utility-marginal cost-marginal return could be realistically defined in terms of the dimension of time savings.

This question may be partially answered if findings are in agreement when data about only one type of organization are examined. However, the Terrien and Mills,²⁵ study of California school systems presents different findings than those conducted in Western Canada, specifically, the Gill and Friesen²⁶ study.

Terrien and Mills (1955) found "[...] the school administrator may expect that the percentage of his organization which is devoted to administrative tasks may rise as his organization grows"²⁷. Although Gill and Friesen replicated in part the Terrien and Mills' study, the general findings are different. Gill and Friesen concluded, "As school systems increase in size, the proportion of staff in the administrative component declines"²⁸.

25 Frederick W. Terrien and Donald L. Mills, "The Effect of Changing Size Upon the Internal Structure of Organizations", American Sociological Review, Vol. XX, No. 1, February 1955, p. 11-13.

26 Gill and Friesen, Loc. Cit.

27 Terrien and Mills, Op. Cit., p. 13.

28 Gill and Friesen, Op. Cit., p. 4.

As previously mentioned, the research findings across different types of organizations are in conflict. When studies dealing with just one organizational type are compared, the problem persists. This prompts another question. How can the two specific studies, Terrien and Mills²⁹, and Gill and Friesen³⁰, produce conflicting results?

Several areas of investigation seemed appropriate to examine when attempting to account for the differences in the findings of the two studies involving only school systems.

1. Time differential between the studies might have made a difference. The only argument that could be used in terms of the time differential relates to the development of large administrative units in the past decade. In the particular case of Ontario's educational structure, the number of school system administrative units was reduced from 4187 to 1446 from 1955 to 1967³¹. This in the number of units reflects the development of larger administrative units over the time differential between the two studies in question.

29 Terrien and Mills, Loc. Cit.

30 Gill and Friesen, Loc. Cit.

31 The Reorganization of School Jurisdictions in the Province of Ontario, Vol. 1, A Guide for Northern Ontario, Ontario Department of Education, January 1968, Appendix "A", p. 1-50.

If such a trend in the development of larger administrative units had occurred in both California and Western Canada and if small units exhibit different gradients of change than do large units, the disparate findings between California and Western Canada over a twenty-two year period might be resolved.

2. A more immediate explanation for the divergent findings may possibly lie within variabilities in the definitions of organizational size and/or administrative component. In this regard, both studies utilized total number of employees to define organizational size. Comparison of definitions of administrative component and organizational size of these and other studies are presented in Appendix 1.

Regarding the assignment of staff to the administrative component, the following definitions for both the Terrien and Mills and the Gill and Friesen studies are presented.

Terrien and Mills (1955):

The administrative component of the school districts included the superintendent, his assistants, and immediate staff, principals, business administrators, and the like. Persons in the non-administrative component were teachers, nurses, custodians, cafeteria workers and the like. Students were not included.³²

32 Terrien and Mills, Op. Cit., p. 12.

Gill and Friesen (1967):

The administrative staff for purposes of the study included (a) principals, (b) personnel identified as administrative and non-administrative staff, but employed or housed directly in the central office of the school system. It included pupil personnel workers for example. Clerical and custodial; and cafeteria staffs, and staffs of such sections as stores, equipment or maintenance were excluded. The number of administrative staff was expressed as a percentage of the total size of the school system. This proportion is termed the administrative ratio.³³

In the Terrien and Mills' study, the terms "administrative personnel" and "the like"³⁴ were not made clear. Essentially the same thing may be said of the more recent study by Gill and Friesen. Their use of "personnel defined both as administrative and non-administrative staff, but housed or employed directly in the central office of the school system"³⁵ was more clearly defined than that of the companion study. However, the personnel of the component were not explicitly identified.

The Terrien and Mills' study would be difficult, if not impossible, to replicate due to their definitional ambiguity and lack of specificity in the makeup of the administrative component. For example, Gill and Friesen

33 Gill and Friesen, Op. Cit., p. 3.

34 Terrien and Mills, Loc. Cit.

35 Gill and Friesen, Loc. Cit.

explained that clerical staff were not included in the administrative component³⁶, but the Terrien and Mills' study bore no mention of whether clerical staff were included or not³⁷.

Acknowledging definitional ambiguity in the two studies, the question arose: Might this result in disparate findings? Differences in definition appear, on the surface at least, to only inflate or deflate the administrative component to the total organizational size in the two studies. Possibly, this inflation or deflation might make a difference between finding a linear rather than a curvilinear relationship between increasing organizational size and the relative number of administrative personnel. However, in no way do the differences account for a finding of an inverse relationship between the two variables.

3. Another possible explanation of the differences in the findings of Gill and Friesen and Terrien and Mills is that the administrative component was incorrectly identified or categorized in at least one of the two studies. However, Anderson and Warkov, in commenting upon the findings of their own study and those of Terrien and Mills, advance the notion that,

36 Gill and Friesen, Ibid., p. 4.

37 Terrien and Mills, Loc. Cit.

There is no reason to believe that the proportion of such personnel (personnel who perform some administrative activities but who are not so classified) is substantially greater (or lesser) in large than in small organizations.³⁸

It follows then that definitional differences alone are insufficient to account for the inconsistencies in the major findings of the two studies.

4. A more general and alternative explanation for divergent findings between the two studies of Terrien and Mills and Gill and Friesen relates to the exploratory nature of their work. In the exploratory phases of any given area of research, one of the most difficult tasks is merely that of locating those variables which seem to be the most important in accounting for the variation in some independent variable. The independent variable for purposes of this discussion is administrative ratios.

Related research, to date, has not thoroughly investigated the relative importance of a plurality of independent variables, other than size, as they affect varying administrative component ratios. It is a basic truism that social scientists must deal with large numbers of variables in their investigations. It is not inconceivable, given the dynamic interrelationships of

38 Anderson and Warkov, Op. Cit., p. 27.

organizational variables, that factors yet to be determined might bear a causal relationship with the dependent variable of administrative component ratios. Indeed, the direct and indirect effects of the independent variable of organizational size have yet to be fully explored.

Possibly when these other factors are identified, investigated, and assessed, the disparate findings might be further explained.

The supposition that there may be unidentified factors influencing the size of the administrative component ratio stems, in part, from present reactions to Weber's ideal type bureaucracy presently witnessed among the writings dealing with new and emerging conceptualizations of organizational analysis³⁹.

The contention that unidentified factors may be operative is partially supported in the literature by specific writers who discuss the subject of organizational size as a major determinant of administrative ratios in the two studies.

Anderson and Warkov have hypothesized that an increase in the number of work locations (multiple sites) and task differentiation at one location may lead to an

39 Richard H. Hall, "The Concept of Bureaucracy: An Empirical Assessment", American Journal of Sociology, Vol. LXIX, No. 1, July 1963, p. 32-40.

increase in the relative size of the administrative component⁴⁰.

Haire⁴¹ and Greiner⁴² both propose that during certain growth periods, age of the organization is more important than total size in determining the relative size of the supportive component. Size and age might, indeed, be causal contextual variables. Starbuck states that utilization of independent variables such as size and age, when size is defined as "change in an organization's membership or employment"⁴³, could produce correlations with certain organizational characteristics.

It is important to note, as Starbuck further states, that discovering that certain organizational structural features correlate with the contextual variables of size and age is not sufficient justification for attributing

40 Anderson and Warkov, Op. Cit., p. 27.

41 Mason Haire, "Biological Models and Empirical Histories of the Growth of Organizations", in Mason Haire, (ed.), Modern Organization Theory, New York, John Wiley and Sons, Incorporated, 1959, p. 287-293.

42 Larry C. Greiner, "Evolution and Revolution as Organizations Grow", Harvard Business Review, Vol. I, No. 4, July-August 1972, p. 37-46.

43 William H. Starbuck, "Organizational Growth and Development", in James G. March (ed.), Handbook of Organizations, Chicago, Rand, McNally and Company, 1965, p. 451-533.

such features to size and age⁴⁴. Correlations are not synonymous with causality⁴⁵. In connection with the limitations of indices of association, all of the related studies dealing with an investigation of organizational size as a determinant of administrative component ratios have made inferences as a result of the utilization of the Pearson (r) correlation coefficient. Such inferences are extremely hazardous since the usage of the Pearson (r) has an underlying assumption of linearity. There is some evidence, both empirical and theoretical, to suggest that there might be a significant curvilinear relationship between the variables of organizational size and administrative component ratios.

5. Tossi and Patt offer the following explanation as a means of resolving studies with conflicting results:

44 Ibid.

45 Frederick N. Kerlinger and E. J. Pedhazur, Multiple Regression in Behavioral Research, New York, Holt, Rinehart and Winston, 1973, p. 155.

Perhaps the ratio of certain specific administrative and support units decreases as organization size increases, but as the organization grows in size, and more specialities are required, a greater number of different administrative and support units may be required. Perhaps, any single unit, whether it be production staff, support staff, administrative staff or custodial services may decrease as a function of total organization size, but the number of personnel assigned to all 'support' functions must be greater.⁴⁶

Tossi and Patt further state "[...] this is obviously speculation, and must be answered by further research. Certainly more studies, with more precisely defined measures, would be of value"⁴⁷.

In summary, the findings reported in the review reflect an obvious lack of agreement and the inconclusiveness associated with research already conducted in the area suggests a rationale for further research. Generally speaking, most of the studies associated with the phenomena of increasing and decreasing administrative component ratios were exploratory in nature and in certain studies this topic was of secondary importance. Subsequently, no study has offered a complete explanation of the exact nature of varying administrative component ratios. The following conclusions appear to be warranted:

46 Tossi and Patt, Op. Cit., p. 168.

47 Ibid.

1. There is no generally applicable definition of the administrative component. Inapplicability of definitions across and between organizational types has compounded the ambiguity associated with related research. Tossi and Patt point up the importance of uniformity of definitions: "There is little doubt [...] that uniform definitions and procedures would be more desirable and greatly reduce the hazard of drawing conclusions"⁴⁸.

2. Failure to explain the contradiction of Terrien and Mills' findings with those of Gill and Friesen through inspection of the studies themselves as well as related studies lends plausibility to the contention, previously expressed by this writer, that unidentified factors in organizations might be influencing the relative size of the administrative component ratio.

3. The conspicuous lack of conceptualizations of organizational structure and analytical foundations afforded by the utilization of theory has derogated against a satisfactory resolution of conflicting results evidenced in this review of related studies.

The necessity for this researcher to address himself to the implications of the previous three conclusions is obvious. Therefore, the concerns of 1) definitional

48 Ibid., p. 166.

ambiguity, 2) identification of related factors, and 3) acceptable conceptualizations of organizational structure and valid theoretical frameworks will be addressed next.

2. Supportive Component.

To date, the absence of a clear-cut definitional taxonomy of educational terms, specifically administrative and supportive, has derogated against a more informative comparison of related studies. Consequently, there is a need to develop a classificatory scheme for instructional and non-instructional personnel at the school district level. Such a classificatory scheme should reflect a reasonably high degree of applicability across different types of school districts and possibly, in the case of the Canadian educational setting, across provincial boundaries. The immediate concern must be for the applicability of the classificatory scheme across intra-provincial school district types. In this section of the report an attempt will be made to develop a supportive component classificatory scheme while capitalizing upon the refinements in methodology evidenced in the most recent related studies. The term supportive will be employed to designate personnel complements that are not directly related to pupils at the instructional level of school operations.

The existence of the supportive component as a formal structural characteristic of organizations was first enunciated by the sociologist, Weber, in his definition of bureaucracy.

Bureaucracy establishes a relationship between legally installed authorities and their subordinate officials, which is characterized by defined rights and duties, prescribed in written regulations; authority regulations between positions, which are ordered systematically; appointments and promotions based on contractual agreements and regulated as a formal condition of employment; fixed monetary salaries; a strict separation of office and incumbent in the sense that the official does not own the 'means of administration', and cannot appropriate the position, and administration work as a full-time position.⁴⁹

Weber's notion of the relationship between legally installed authorities and their subordinates is reiterated in Parsons' translation of the Ideal Bureaucracy, "A clearly defined hierarchy of offices exist"⁵⁰. Obviously, the hierarchy of offices was designed to provide an organizational framework in which the two groups of personnel, workers (production), and management (administration), were separated with the management directing the operations and

49 Talcott Parsons, The System of Modern Societies, Englewood Cliffs, New Jersey, Prentice-Hall, Incorporated, 1971, p. 4.

50 Max Weber, "The Ideal Bureaucracy", translation by Talcott Parsons, in Groups and Organizations, Bernard L. Hinton and H. Joseph Reitz (eds.), Belmont, California, Wadsworth Publishing Company, 1971, p. 53.

providing the norms of rationality which governed the decision-making process.

The unitary concept of Weber's ideal type bureaucracy, far from having become a reality, has ceased to be the ideal type for many theorists. Presently, critics of Weber maintain that bureaucracy is a feature of most organizations rather than being a type of organization. All modern organizations exhibit bureaucratic principles and the most conspicuous of the formal characteristics that has resisted pressure to undergo any major reorganization is that of the hierarchy of offices. The nature of the modern organization's activities has become increasingly complex which has resulted in higher degrees of subdivision of labor in order to adequately cope with the very specialized task responsibilities that seem to be a feature of most modern organizations. Such division of labor has re-defined Weber's two organizational personnel levels, management and production. Consequently, personnel categories or complements have further developed within the two original terms utilized by Weber.

Attempts to redefine the original terms, administrative and non-administrative, of both the Terrien and Mills (1955) and the Gill and Friesen (1967) studies is seen in the refinements in methodology of the studies conducted in Western Canada from 1967-1971. Vithayathil

(1969) utilized six different definitions of administrative staff. Each definition included the summative core category of "central office administrative staff"⁵¹. Holdaway (1971) adopted three major classifications of school system personnel, "administrative", "auxiliary", and "support"⁵². Administrative personnel were further categorized as a) senior, b) intermediate, c) supervisory, and d) service. Two subdivisions of auxiliary personnel were designated on the basis of those who were working primarily with pupils or those who had other functions such as programming, planning and architecture⁵³.

It is proposed that a set of personnel classifications, similar to that utilized by Holdaway (1971)⁵⁴, be developed. Consequently, explanations of increasing or decreasing administrative component ratios may be specific to clearly designated categories within the total supportive component. In addition, it would facilitate the formulation of multiple definitions of the administrative ratio utilizing different combinations of these different categories. Furthermore, the development of a

51 Holdaway and Vithayathil, Op. Cit., p. 16.

52 Holdaway (1971), Op. Cit., p. 30.

53 Holdaway, Ibid.

54 Holdaway, Ibid.

specific supportive component classification would allow this researcher to effect greater control for variations in district personnel and hence remove the necessity to utilize approximations in formulating different administrative ratios. Such variations between organizations, particularly educational organizations, is typified by the fact that some organizations contract services rather than hire their own staff, particularly for health and transportation which invariably cause distortions in administrative ratios which comprise auxiliary or service components.

Consequently, the following is recommended:

School Board Personnel

1. Administrative: — top positions at the central office, intermediate and school levels.

- a) Director(s)
- b) Superintendent(s)
- c) Principal(s)
- d) Assistant or associate director(s) who fulfill line functions.

2. Intermediate: — immediate positions on next hierarchical level to superordinates at top positions.

- a) Administrative assistant(s)
- b) Assistant superintendent(s)
- c) Business administrator(s)
- d) Vice-principal(s)
- e) Assistant or associate director(s) excluded in administrative category.

3. Supervisory: — persons charged with direct responsibility of over-seeing curriculum development and conducting instructional supervision.

- a) Subject specialist(s)
- b) Consultant(s)
- c) Department head(s)
- d) Instructional media specialist(s)
- e) General supervisor(s)

4. Auxiliary: — persons charged with the direct responsibility of providing special services to promote student welfare.

- a) Psychologist(s)
- b) Psychomotrist(s)
- c) Speech and/or Hearing specialist(s)
- d) Nurse(s)
- e) Counsellor(s)
- f) Attendance officer(s)

5. Clerical: — persons charged with no supervisory duties. Their sole responsibilities relate to typing, writing and recording.

- a) Secretary(ies)
- b) Typist(s)
- c) Accountant(s)
- d) Data processor(s)
- e) Bookkeeper(s)
- f) Librarian(s)
- g) Clerk(s)
- h) Receptionist(s)

6. Service: — persons charged with responsibilities of general upkeep and cleaning of board facilities or providing transport and cafeteria services.

- a) Maintenance worker(s)
- b) Sanitary engineer(s)
- c) Domestic(s)
- d) Transport worker(s)
- e) A.V. technician(s)

Finally, the production complement which is not considered as support in the same fashion as the above categories would include the remainder of a district's total adult personnel, namely teacher(s) and teacher aide(s).

The categories of supervisory and auxiliary could be collected under the one term professional; however, there appears to be a slight distinction between the types of services provided by each and the end to which these services are directed.

In summary, the preceding classification scheme would allow the present researcher to deal with different segments of the total district personnel individually in determining variances in economies of scale in the administrative component. It is quite possible that certain categories of the total support personnel will exhibit different economies of scale and might provide some basis for explaining different patterns of increase or decrease in administrative component ratios relative to increases

in organizational growth. Most importantly, it allows this researcher the opportunity to develop multiple definitions of administrative component ratios that differ with respect to the inclusion or exclusion of personnel categories rather than occupational types which has been the case in many of the related studies.

3. Organizational Complexity.

The reactions against the Weberian imperatives of organizational bureaucratization have led to the development of new ways of describing organizations in an empirical manner, and in appreciation of the complex, dynamic nature of structure. This study as well as future studies must be conducted in the light of the dynamic interrelationships of organizational variables. Consequently, a discussion centering upon the dynamics or complexity of organizations must be presented.

Bakke's (1969) formulation of the 'Descriptive Model' of organizational analysis vividly reflects the concern for the dynamics of organizational structure. Bakke considered that an organization is composed of a charter, basic resources, and environmental influences. These become operationalized by the organizational elements of individual and group behavior, prescribed functions, instruments, support personnel, and stabilizing elements.

Consequent upon the operationalization of these organizational elements, activities produce a series of bonds which are identifiable on the basis of organizational needs⁵⁵.

Bakke's formulation reflects a concern for the patterned nature of activities which, in turn, emphasizes complexity⁵⁶.

Heydebrand further addresses this complexity issue in his analysis of the Anderson and Warkov study of U.S. army hospitals. He suggested that "Functional (structural) complexity, rather than size as such, is a crucial determinant of the degree of internal bureaucratization"⁵⁷. Heydebrand concluded that,

Perhaps the most important single conclusion from this study is that an understanding of organizational structure cannot be obtained from the correlation of any two characteristics alone. [...] it is the complex pattern of their inter-relationships which constitutes the 'new reality' of organizational studies.⁵⁸

For Heydebrand, structural complexity encompassed the following variables: size of administrative staff,

55 Edward W. Bakke, "Concept of the Social Organization", in Mason Haire (ed.), Modern Organization Theory, New York, John Wiley and Sons, Limited, 1959, p. 16-75.

56 Bakke, Ibid.

57 W. V. Heydebrand, "The Study of Organizations", Social Science Information, Vol. VI, No. 4, October 1967, p. 59-86.

58 Ibid., p. 70.

diversification of major objectives, managerial-supervisory ratios, degree of departmental specialization, degree of professionalization, types of ownership and kinds of external control⁵⁹.

Simon's preference for the term organized complexity is at variance with the physical scientist's continuum of organized simplicity to chaotic complexity⁶⁰. Simon claims that such a continuum, extending from simplicity to complexity, is inadequate for describing human organizations, and he further argues that,

Complexity frequently takes the form of hierarchy and that hierarchical systems have some common properties which are independent of their specific content.⁶¹

Friesen et al., in their discussion concerning new conceptualizations of organizational structure, suggest:

59 Ibid.

60 Herbert A. Simon, "The Architecture of Complexity", in Ludwig Von Bertalanfy and A. Rappaport (eds.), General Systems, Yearbook for the Society of General Systems Research, Vol. X, 1965, p. 64.

61 Ibid., p. 70.

Weberian imperatives are basic to a consideration of structure, that reactions to bureaucratic imperatives have emphasized the dynamic, complexity of structure and that consideration of time introduces an evolutionary dimension to structure. The complex of changing patterns of organizational structures seems to suggest that a study of structure is, in large part, a study of the institution at the institutional level.⁶²

In surveying the literature, this writer notes that the earliest attempt to give operational meaning to complexity, by Udy⁶³, utilized supervisory attention as an intervening variable linking complexity to the development of authority levels. Subsequent research by Anderson and Warkov⁶⁴, in their study of tuberculosis, general medicine and surgery hospitals, has as an intervening variable the broader concept of coordination. Evolving from this position, complexity came to refer to the division of labor in Rushing's⁶⁵ analysis of administrative components in

62 David Friesen et al., "The Structural Analysis of Educational Organizations — The Aston Approach within the Canadian Context", A Research Symposium of C.E.R.A. Annual Conference, Laval University, June 4, 1976, p. 1-51.

63 Stanley H. Udy, Jr., "The Structure of Authority in Non-Industrial Production Organizations", American Journal of Sociology, Vol. LXIV, No. 1, June 1959, p. 582-584.

64 Anderson and Warkov, Op. Cit., p. 23-28.

65 William A. Rushing, "The Effects of Industry Size and Division of Labor on Administration", Administrative Science Quarterly, Vol. XII, No. 1, June 1967, p. 273-295.

industrial firms. Other writers, such as Hage⁶⁶, consider functional complexity to mean the degree of occupational specialization.

The importance of complexity, as a variable in organizational analysis, has been stressed by many other authors. Zelditch and Hopkins write,

Large size, in our view, is not a critical characteristic of organizations. Rather, what appears to be more important here is complexity which is often indicated by size but is quite distinct from it.⁶⁷

Caplow specifies a complexity-size relationship when he says, "The relational complexity in small groups increases rapidly with small increases in size"⁶⁸.

Blau and Scott suggest the centrality of complexity when they comment, "Since formal organizations are often very large and complex, some authors refer to them as 'large-scale' or very 'complex' organizations"⁶⁹.

66 Jerald Hage, "An Axiomatic Theory of Organizations", Administrative Science Quarterly, Vol. X, No. 3, December 1965, p. 294.

67 Morris Zelditch, Jr. and Terrence K. Hopkins, "Laboratory Experiments with Organizations", in Amitai Etzionni, Complex Organizations, New York, Holt, Rinehart and Winston, Incorporated, 1961, p. 47.

68 Theodore Caplow, "Organizational Size", Administrative Science Quarterly, Vol. I, No. 4, March 1957, p. 485-505.

69 Peter M. Blau and Richard W. Scott, Formal Organizations, San Francisco, Chandler Publishing Company, 1962, p. 7.

The authors then suggest that usage of the term complex in naming a whole area of analysis, complex organizations, is misleading due to the wide variations in complexity existent among organizations.

Anderson and Warkov utilize Durkheim's assertion, "the growing density of population in a society results in increasingly complex forms of organizations"⁷⁰, in conjunction with the observations of Simmel and Spencer, "An increase in size necessitates more complex forms of communication"⁷¹, to establish the importance of the concept of organizational complexity to the size relationship.

There appears to be reason to assume that organizational complexity is possibly related to organizational factors other than size.

It is quite possible that organizations with multiple goals are more complex than those having fewer goals. Organizations with widely dispersed facilities should be more complex than those having compact or single facilities. Anderson and Warkov note that,

⁷⁰ Emile Durkheim, "On the Social Division of Labour in Society", and Herbert Spencer, Principles of Sociology, and George Simmel, "The Number of Members as Determining the Sociological Form of the Group", in Anderson and Warkov, Op. Cit., p. 24.

⁷¹ Ibid., p. 24.

The function of coordination is alleged to become relatively more difficult with increased numbers of personnel and with a greater variety of role tasks and activities.⁷²

The variety of tasks in some organizations certainly varies from those in other organizations. As such, some could be said to be more complex than others. Organizations which have interaction and independent relationships with other agencies within the environment should be more complex than those organizations which do not have such relationships.

The evidence, while neither overwhelming nor conclusive, may warrant the inclusion of complexity as an explanatory variable in the size-administrative ratio relationship. According to Anderson and Warkov, complexity might be more important than size of the organization in determining the administrative component size⁷³. Blau and Scott make a case for the importance of the complexity variable in their analysis of Terrien and Mills' study.

Large school systems were probably more complex than the smaller ones — administering several schools in different locations rather than a single one — and this complexity, not size itself, may have been responsible for their larger administrative staffs.⁷⁴

72 Ibid., p. 24.

73 Anderson and Warkov, Op. Cit., p. 28.

74 Blau and Scott, Op. Cit., p. 227.

While there appears to be some agreement that the degree of complexity of an organization is important in determining structural characteristics and in organizational analyses, the task of identifying the components of the concept, complexity, is a major task considering the fact that different intraorganizational structures will vary both in their degree and type of complexity. Consequently, to obtain a realistic measure of an organization's total structural complexity, one must, of necessity, conceptualize a summative measure for a possible plurality of predictors.

Hall appears to provide a framework for the variable, complexity, as a multidimensional concept. According to Hall, "the three elements of complexity most commonly identified are horizontal differentiation, vertical or hierarchical differentiation, and spatial dispersion"⁷⁵.

Blau, in turn, provides us with the basic definitions that permit translation of the concept, differentiation, into operational measures:

⁷⁵ Richard H. Hall, Organizations: Structures and Process, Englewood Cliffs, New Jersey, Prentice Hall, Incorporated, 1972, p. 143.

A dimension of differentiation is any criterion on the basis of which the members of an organization are formally divided into positions, as illustrated by the division of labor; or into ranks notably managerial levels; or into subunits, such as local branches or divisions. A structural component is either a distinct official status (for example, one branch or one division). The term differentiation refers specifically to the number of structural components that are formally distinguished in terms of any one criterion. The empirical measures used are number of branches, number of occupational positions (division of labor), number of hierarchical levels, number of divisions and number of sections within branches or divisions.⁷⁶

The multifaceted approach that Hall uses in his attempt to develop a comprehensive view of structural complexity is consistent with the now generally held view that complexity is, indeed, a multidimensional term. A closer look at Hall's three indicators appears warranted.

A. Horizontal Differentiation. Horizontal differentiation is the "way the tasks performed by the organization are subdivided among the members"⁷⁷. This subdivision of task responsibilities typifies the improvement attainable through the subdivision of labor.

⁷⁶ Peter M. Blau, "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 204-205.

⁷⁷ Hall, Op. Cit., p. 143.

The more completely simple tasks are separated from the various kinds of complex ones, the easier it is for the unskilled employees to perform the routine duties and for skilled employees to acquire the specialized training and experience to perform the difficult complex ones.⁷⁸

Hall distinguishes between the two types of horizontal differentiation resulting from subdivision of responsibilities.

First, highly trained specialists are assigned a comprehensive range of activities to perform, and the second occurs when tasks are minutely subdivided to meet the capabilities of non-specialists.⁷⁹

The two distinct types of horizontal complexity enumerated by Hall⁸⁰ have been operationally defined differently by several authors. Hage, in his axiomatic theory, provides us with the following definition of complexity:

Specialization in an organization [...] measured by the number of occupational specialties and the length of time of training required by each. The greater the number of occupations and the longer the period of training required, the more complex the organization.⁸¹

78 Blau, Op. Cit., p. 204

79 Hall, Loc. Cit.

80 Hall, Loc. Cit.

81 Hage, Op. Cit., p. 294.

Reiman provides us with yet another approach to the measuring of complexity,

Functional complexity is measured by the number of discrete, identifiable functions performed by at least one full-time specialist. The empirical measure of functional complexity was obtained and no account was taken of either a) specialist's status or b) whether an organization had many specialists or only one. For each activity that there was a specialist the organization scored one.⁸²

The important work of the Aston Group⁸³ provides us with an empirically derived definition of specialization that appears to encompass both Reiman's definition and Hall's particular definition of his first type of horizontal differentiation.

Specialization is concerned with the division of labor within the organization, the distribution of official duties among a number of positions [...] and the extent to which these specialist roles exist within each of the sixteen functional specializations.⁸⁴

Blau and Schoenherr assume a slightly different pose when they define horizontal differentiation as

82 Bernard C. Reiman, "On the Dimensions of Bureaucratic Structure: An Empirical Reappraisal", Administrative Science Quarterly, Vol. XVIII, No. 4, December 1973, p. 462-476.

83 D. S. Pugh et al., "Dimensions of Organizational Structure", Administrative Science Quarterly, Vol. XIII, No. 1, June 1968, p. 65-105.

84 D. S. Pugh et al., Ibid., p. 72-73.

"number of different positions and different subunits in the organization"⁸⁵. Thus, organizational complexity may be determined by the actual number of positions or subunits. An example of this type of complexity indicator would be "number of departments and non-departmentalized schools"⁸⁶ as used by Hawley et al., in their study of Canadian institutions of higher education.

Blau and Schoenherr's definition is similar to the indicator of complexity, "Division of Labor - Specific"⁸⁷, used by Hass et al., in their investigation of the relationships among organizational size, complexity, and formalization using data collected from seventy-five organizations. Rushing raises an objection to the utilization of labor. "It does not take into account the distribution of individuals throughout the parts"⁸⁸. However, it may be argued that if division of labor is combined with vertical differentiation then the distribution of individuals should

⁸⁵ Peter M. Blau and Richard A. Schoenherr, The Structure of Organizations, New York, Basic Books, Incorporated, 1971, p. 16.

⁸⁶ Hawley et al., Op. Cit., p. 252-253.

⁸⁷ Eugene Hass, Norman Johnson and Richard H. Hall, "Organizational Size, Complexity and Formalization", American Sociological Review, Vol. XXXII, No. 6, December 1967, p. 903-912.

⁸⁸ Rushing, Op. Cit., p. 281.

be reflected in the total measure of both types. One would think that the variability of the distribution of individuals from one organization to another should correlate highly with the distribution of parts both horizontally and vertically.

B. Vertical Differentiation. Definitions and operational measures of vertical differentiation, as a concept, do not seem to be as difficult to obtain as those for horizontal differentiation.

Meyer defines hierarchical differentiation as "increasing vertical division of labor"⁸⁹. He continues in his article to state that the "proliferation of supervisory levels"⁹⁰ could be used as an empirical measure.

Pugh et al., suggest that,

The vertical span of control (or height) of the workflow superordinate hierarchy (line chain of command) may be measured by a count of the number of job positions between the chief executive and the number of employees on the output.⁹¹

Pugh and his colleagues excluded assistants to line personnel, and secretaries in their attempt to obtain an index of configuration or shape of organizations⁹².

89 Marshall Meyer, "Two Authority Structures of Bureaucratic Organizations", Administrative Science Quarterly, Vol. XIII, No. 2, September 1968, p. 214.

90 Ibid., p. 216.

91 Pugh et al., Op. Cit., p. 78.

92 Ibid.

Hass and his colleagues utilized two measures of hierarchical differentiation, "number of levels in the deepest single division", and the "mean number of levels for the organization as a whole"⁹³, in their attempt to operationally define one of four measures of complexity.

C. Spatial Dispersion. Spatial dispersion is generally defined in terms of geographical distance between divisions or branches and central office facilities. As such, spatial dispersion may possibly be a summative element for both horizontal and vertical forms of differentiation.

Hall maintains that,

Spatial dispersion becomes a separate element in the complexity concept when it is realized that an organization can perform the same functions with the same division of labor and hierarchical arrangements in multiple locations. Complexity is thus increased if organizations develop more spatially dispersed activities even if horizontal and vertical differentiation is much the same across dispersed facilities such as branches and field offices.⁹⁴

Empirical measures of spatial dispersion are relatively easy to obtain. Raphael utilized "number of spatially separate places at which the members of local unions are employed"⁹⁵. Raphael further stated,

93 Hass, Hall and Johnson, Op. Cit., p. 906.

94 Ibid.

95 Edna E. Raphael, "The Anderson-Warkov Hypotheses in Local Unions: A Comparative Study", American Sociological Review, Vol. XXXII, No. 5, October 1967, p. 770.

At one extreme of the continuum organizations have memberships concentrated in the plant settings. At the opposite end of the continuum, the membership is so evenly dispersed spatially, that they even rotate continuously among numerous shops, jobs, and employers within a geographical space of at least several square miles.⁹⁶

Hass et al. utilized four indicators of spatial dispersion in their particular study:

1. The degree to which physical facilities are spatially dispersed.
2. The location of spatially dispersed facilities.
3. The degree to which personnel are spatially dispersed, and
4. The location of spatially dispersed personnel.⁹⁷

The four components of complexity and their operational definitions presented by Hall⁹⁸ were incorporated in Hass, Hall and Johnson's study of the size-complexity-formulation relationships in seventy-five different organizations and are presented in Appendix 2.

In summary, the concept of complexity, according to numerous authors, is extremely important in any study dealing with organizational structure. The concept complexity has been defined in such a manner that three major

96 Ibid.

97 Hass, Hall and Johnson, Loc. Cit.

98 Hall, Op. Cit., p. 143.

components of the term have been identified as horizontal differentiation, hierarchical (vertical) differentiation, and spatial dispersion, and some support exists for each component. Due to the multidimensionality of the concept complexity, it is imperative that all three components be included in future studies that deal with structural complexity. Consequently, explanations of different levels of organizational complexity within the same organizational type could be specific to any of the individual components, as well as to a summative measure of total structural complexity. Studies which treat complexity as a unitary concept only permit comparison at a general level of discussion.

4. The Aston Conceptualization of Structure.

The importance of emerging conceptualizations of organizational structure as a means of identifying major independent variables and major dependent variables in organizational structural analysis cannot be overemphasized. Previous related studies, specifically the Gill and Friesen⁹⁹ and the Terrien and Mills¹⁰⁰ research, did not have recourse to the benefits that new and emerging conceptualizations

99 Gill and Friesen, Op. Cit., p. 1-4.

100 Terrien and Mills, Op. Cit., p. 11-13.

offer. Consequently, previous studies have lacked conceptual frameworks which generally present a causal network of a relatively small set of homogeneous variables that are considered important by theorists and writers who discuss the subject of organizational analysis.

The following discussion will present an overview of the conceptualization adopted for use in this present study and the particular contributions that it makes to the overall design of the research.

A new conceptualization for the investigation of organizational structure has emerged from the "Aston studies"^{101,102,103}. The Pugh et al. studies have become known as the Aston studies because of Pugh et al.'s association with the University of Aston in Birmingham, England. The major objective of the Aston studies was to examine the relationship between organizational structure and personal behavior (at group and individual levels) in organizations. As Pugh et al. state:

101 D. S. Pugh et al., "A Conceptual Scheme for Organizational Analysis", Administrative Science Quarterly, Vol. VIII, No. 3, September 1963, p. 289-315.

102 D. S. Pugh et al., "Dimensions of Organizational Structure", Op. Cit., p. 65-105.

103 D. S. Pugh et al., "The Context of Organizational Structure", Administrative Science Quarterly, Vol. XIV, No. 1, March 1969, p. 91-114.

We are concerned with the attempt to generalize and develop the study of work organizations and behavior into a consideration of the interdependence of three conceptually distinct levels of analysis of behavior and organizations:

- 1) organizational structure and functioning,
- 2) group composition and integration, and
- 3) individual personality and behavior.¹⁰⁴

Consistent with this objective, their first step was to develop "an empirically-based multidimensional analysis of the structural variables of organizations"¹⁰⁵.

A. Structural Variables. Using Weber as a starting point, the Aston researchers first isolated the conceptually distinct elements in his formulation of bureaucracy. Following Heady's¹⁰⁶ suggestion, they distinguished between structural and behavioral elements and conceptualized six dimensions of organizational structure.

As a basis for conceptualization, they drew upon Bakke's¹⁰⁷ analysis of the process of work organizations, and subsequently listed and defined five variables (the sixth, flexibility, was dropped because its measurement required diachronic data which was not available) as follows:

104 Pugh et al., 1963, Op. Cit., p. 292.

105 Pugh et al., 1963, Ibid., p. 298.

106 F. Heady, "Recent Literature on Comparative Public Administration", Administrative Science Quarterly, Vol. V, No. 3, December 1960, p. 134-154.

107 Bakke, Op. Cit., p. 16-75.

1. Specialization. Specialization was concerned with the division of labor within the organization, and the distribution of official duties among a number of positions. These activities excluded the workflow activities of the organization.

2. Standardization. Standardization was concerned with legitimized procedures to cover all circumstances.

3. Formalization. Formalization denoted the extent to which rules, procedures, instructions, and communications were written down.

4. Centralization. Centralization was concerned with the locus of authority to make decisions affecting the organization.

5. Configuration. Configuration denoted the shape of the role structure in terms of counts of positions and ratio of various classes of employees.¹⁰⁸

The fifth variable, Configuration, of the Aston structural variables is of particular significance for the present report. This significance is seen in the fact that its definition reflects a high degree of congruence with the dependent variable, administrative ratios, of the present study. For purposes of comparison, the dependent variable of administrative ratios of the present study received the following definition: Ratio of individual and/or combinations of specific supportive component categories to an index of organizational size.

¹⁰⁸ Pugh et al., 1963, Op. Cit., p. 301-308.

B. Contextual Variables. The Aston researchers identified those aspects of context which have been found important by other researchers. For example, Etzionni¹⁰⁹ emphasized the importance of goals (charter); Woodward¹¹⁰ that of technology; Presthus¹¹¹ that of size, and Eisenstadt¹¹², that of dependence.

The importance of an organization's context was noted by Pugh and his colleagues as follows:

The structure of an organization is closely related to the context within which it functions, and much of the variation in organizational structure might be explained by contextual factors. Many such factors, including size, technology, organizational charter or social function and interdependence with other organizations, have been suggested as being of primary importance in influencing the structure and function of an organization.¹¹³

109 Amitai Etzionni, Modern Organizations, Englewood Cliffs, New Jersey, Prentice Hall, Incorporated, 1964, p.1-20.

110 Joan Woodward, Management and Technology, Problems of Progress in Industry Series, No. 3, London, Her Majesty's Stationery Office, 1958, p. 23.

111 Robert Presthus, "Toward a Theory of Organizational Behavior", Administrative Science Quarterly, Vol. III, No. 1, June 1958, p. 48-72.

112 S. N. Eisenstadt, "Bureaucracy, Bureaucratization, and Debureaucratization", Administrative Science Quarterly, Vol. IV, No. 3, December 1959, p. 302-320.

113 Pugh et al., 1963, Op. Cit., p. 308-312.

Accordingly, the Aston approach was to "[...] relate these contextual aspects of structure [...] employing a multivariate factorial approach in both context and structure"¹¹⁴. They listed and defined the contextual variables as follows:

1. Origin and History. This variable considered the age of the organization and whether the organization was entrepreneurial or government owned.

2. Ownership and Control. This variable included the degree of public accountability and the relationship of ownership and management.

3. Size. This variable included the number of employees, net assets utilized and the number of employees in the parent management.

4. Charter. This variable was concerned with the goals and self image of the organization.

5. Technology. Technology was defined as the sequence of physical techniques used on the workflow of the organization.

6. Location. This variable was concerned with the number of operating sites of the organization.

7. Dependence. This variable measured the interdependence with other organizations: included were such concepts as the number of specialisms contracted out and integration with suppliers.¹¹⁵

The Aston contextual variables are not to be confused with the context of the organization; they are the

¹¹⁴ Pugh et al., 1969, Op. Cit., p. 95-107.

¹¹⁵ Pugh et al., 1963, Ibid., p. 95-107.

context of the structures of the organization. They do not (except for one variable, interdependence) describe the external environment¹¹⁶.

It is important to note that the sixth contextual variable of the Aston studies, location, received an identical intensional definition as the Hass et al. definition of spatial dispersion, namely, location of spatially dispersed facilities (Appendix 2).

The contributions that the Aston conceptualization offer to the present study are as follows:

1. It identifies those contextual variables that have been empirically verified to be the major determinants of organizational structure. The third variable, size, is the first independent variable of the present study.

2. It provides a framework within which this researcher may gain a greater degree of specificity of individual relationships between certain contextual variables and structural variables. This specificity can be achieved through the utilization of still another analytic tool, the formal theory of differentiation in organizations, by Blau¹¹⁷. Blau's theory provides the

116 Friesen et al., 1976, Loc. Cit.

117 Peter M. Blau, "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 201-217.

theoretical connections between the variables of organizational size, complexity, and administrative component ratios.

3. It identifies those contextual variables that must be controlled, either experimentally or statistically, to more accurately assess the relative importance of the independent variables of size and complexity in determining variations in the dependent variable, administrative component's relative size.

The well known, empirically verifiable, Aston conceptualization has become the basis for an increasing number of organizational studies. Specific researchers who have tested the framework of the Aston group are Child¹¹⁸, Reiman¹¹⁹, and Friesen et al.¹²⁰. Specifically, Friesen and his colleagues point out the utility of the Aston conceptualization,

The use of structural variables to study organizations is a direct and parsimonious approach since these variables have a quantitative character and can be constructed from detailed and comprehensive information.¹²¹

118 John Child, "Organizational Structure and Strategies of Control: A Replication of the Aston Study", Administrative Science Quarterly, Vol. XVII, No. 2, June 1962, p. 163-176.

119 Reiman, Op. Cit., p. 462-476.

120 Friesen et al., 1976, Op. Cit., p. i-51.

121 Ibid., p. 5.

In summary, the Aston framework identifies a relatively homogeneous set of contextual factors that have been tested and proven to be major structural determinants. Control for the contextual factors other than size in the attempt to determine the relative magnitude of the direct and indirect relationship of organizational size with the relative size of administrative components should add tremendously to the rigor of this study. Additionally it should lend a higher degree of credibility to the findings of this investigation than would be the case if such control were not exercised.

5. Statement of the Research Problem.

This study will attempt to ascertain the general nature of the relationship between increasing organizational size and variances of administrative ratios. Specifically, the writer's thesis is that the concept of complexity must be taken into consideration if one is to develop a causal relationship between size and ratios.

As noted in the review of the literature, the obvious lack of agreement associated with research already conducted in the area suggests a rationale for further research. This lack of agreement stems, in part, from the absence of theoretical frameworks, organizational conceptualizations, and methodologies in the studies. No investigation has ever

been carried out on the relative effects of organizational size and complexity on variances of administrative ratios. Consequently, few studies utilizing a conceptualization of organizational structure and an underlying theoretical base has investigated the opposite effects of increasing organizational size as it relates to variations in administrative component ratios.

The research problem investigated by this study concerns the structure of selected Ontario school boards. The specific research problem is: Do the factors of organizational size and organizational complexity have a relationship with the administrative ratios within the structures of these boards? That is,

1. How are variations in administrative ratios related to variations in organizational size?
2. How are variations in administrative ratios related to variations in organizational complexity?

6. Theoretical Rationale and Research Hypotheses.

The theoretical rationale addressing the research problem is presented first. A set of two research hypotheses is then generated from the theoretical rationale and presented.

The analytical foundation for the study has been provided by Blau's (1970) endeavour to construct a formal

theory of differentiation in organizations. The theory is confined to an analysis of formal structure independent of organizational type^{122,123}.

Blau provides the following explanatory notes on his theory of differentiation:

A systematic theory is a set of logically interrelated propositions, all of which pertain to connections between at least two variables, and the least general of which, but only those must be empirically demonstrable. [...] The theorist's aim is to discover a few theoretical generalizations from which many different empirical propositions can be derived [...].

The higher level hypotheses that explain the lower-level propositions are accepted as valid purely on the basis that they do explain them, in the specific sense that they logically imply them, and without independent empirical evidence; whereas acceptance of the lower-level propositions that need to be explained is contingent on empirical evidence.¹²⁴

The central concept of differentiation refers specifically to "[...] the number of structural components that are formally distinguished in terms of any one criterion"¹²⁵. Structural components are distinct official statuses and subunits in the organization.

¹²² Blau, Op. Cit., p. 202.

¹²³ Bernard P. Indik, "The Relationship Between Organizational Size and Supervision Ratio", Administrative Science Quarterly, Vol. IX, No. 3, December 1964, p. 301-312.

¹²⁴ Blau, Op. Cit., p. 204.

¹²⁵ Ibid.

Blau advances two basic generalizations from which nine propositions are derived. His first generalization is: "The increasing size of organizations generates structural differentiation along various dimensions at decelerating rates"¹²⁶.

For Blau, the operational definition of size is "total number of personnel"¹²⁷. The essence of the generalization is that expanding size of organizations gives rise to increasing subdivision of responsibilities, facilitates supervision, and widens the control of supervisors. In addition, the expanding size of the organization simultaneously creates structural differentiation which creates problems of coordination that require attention.

Given increases in organizational size, small organizations should initially experience rapid increases followed by more gradual increases in differentiation, that is, number of occupational positions, levels in the hierarchy, number of divisions, and number of sections per division or department. In effect, the marginal influence of size on differentiation decreases. Technically, increasing organizational size is subject to an eventual diminishing marginal physical productivity¹²⁸.

¹²⁶ Ibid.

¹²⁷ Blau, Ibid.

¹²⁸ Ibid., p. 208.

It would appear that differentiation produced by the expanding size of organizations stems the power of additional expansions in size to make the structure still more differentiated. The reason for the eventually declining marginal physical productivity of increments in only one type of economic input, size, is that such increments create an imbalance of inputs and the growing need for other inputs depresses productivity¹²⁹.

The existence of differentiation in a formal organization implies a need for coordination. There are at least two inputs on which the development of structural differentiation in an organization depends:

1. A sufficient number of employees to fill the different positions and man the various sub-units, and
2. An adequate administrative machinery to meet the problems of coordination.¹³⁰

Underlying the inference that differentiation intensifies administrative problems is the assumption that the problems of coordination and communication, in differentiated structures, have feedback effects that create resistance to further differentiation. Hence, the reason why the marginal influence on differentiation declines with

¹²⁹ Kenneth E. Boulding, Economic Analysis, New York, Harper and Row, Limited, 1955, in Blau, Ibid., p. 207.

¹³⁰ Blau, Op. Cit., p. 207.

increasing organizational size. Size must overcome more resistance in more differentiated organizations. Consequently, it therefore takes greater expansions in size to effect a given increment in differentiation in large than in small organizations.

If increasing organizational size is accompanied by decelerating rates of differentiation, then structural components increase more slowly than organizational size. Subsequently, the average size of these structural components necessarily becomes larger. Thus, the large size of an organization raises the average size as well as the number of its structural components. If the number of structural components, the criterion of differentiation, increases as organizational size does, the proportion of all employees who are in the average component must decrease¹³¹.

Consequently, most groups or categories of employees in large organizations are larger in absolute numbers but constitute a smaller proportion of the total personnel than in small organizations. This is to say that the average (mean) relative size of employee complements, on a given dimension, decreases with increasing organizational size, "though not necessarily the proportion of any particular complement"¹³².

131 Blau, Ibid., p. 207.

132 Ibid., p. 210.

Thus, the administrative component, as selected members of several dimensions considered as an aggregate, must correspondingly decline rapidly at first followed by more gradual declines when expressed as a ratio with total personnel. Considering again the importance of the principle of the decelerating rates of differentiation, Blau states that "The economy of scale in administrative overhead declines with increasing organizational size"¹³³. Hence, the following research hypothesis: The mean administrative ratios of small sized school boards are larger than those of either average or large sized school boards.

Large size tends to have opposite effects upon the administrative component. In addition to reducing it due to the economies of scale in supervision, it tends to enlarge it, indirectly through the differentiation that it generates. As Blau states it, "[...] structural differentiation in organizations enlarges the administrative component"¹³⁴.

The underlying assumptions for Blau's generalization concerning the indirect effects of increasing organizational size are as follows:

133 Blau, Ibid., p. 213.

134 Ibid.

Differentiation makes an organization more complex; that a complex structure engenders problems of communication and coordination; that these problems create resistance to further differentiation; that managers, the staff, and even first-line supervisors spend time dealing with these problems; and that consequently, supervisory and administrative manpower is needed in highly differentiated structures than in less differentiated structures.¹³⁵

The savings in administrative overhead that large scale operations makes possible through the economies of scale in supervision (greater intra-unit homogeneity) are counteracted by the expansion in administrative overhead that the structural complexity (differentiation) of large organizations necessitates. Hierarchical and vertical differentiation, as well as spatial dispersion or differentiation, presumably, by engendering problems of coordination, enlarge requirements for managerial manpower. As Blau states it,

If increasing organizational size generates differentiation and if differentiation increases the administrative component, it follows that the indirect effect of increasing organizational size must be to increase the administrative component.¹³⁶

Subsequently, the indirect effects of size mediated by the differentiation that increasing organizational size generates and the direct effects owing to the economies of

¹³⁵ Blau, Ibid.

¹³⁶ Ibid.

scale in supervision are in opposite directions. Consequently, there should be a significant interaction between organizational size and complexity as it affects the administrative ratios from small sized, low complexity school boards to large sized, high complexity school boards. Hence, the following research hypothesis: The difference between mean administrative ratios of small sized, low complexity and large sized, low complexity school boards is different from that between small sized, high complexity and large sized, high complexity school boards.

A large scale of operations would effect tremendous savings in administrative overhead, but these savings are greatly reduced by the structural differentiation of large organizations. Consistently, however, the economies of scale exceed the costs of differentiation, so that large organizations, despite their greater degree of structural complexity (differentiation), require proportionately less administrative manpower than small ones.

The decline in the economy of scale means that the rate of decrease in the ratio of administrative personnel itself declines with increasing organizational size. The growing need for administrative manpower resulting from the structural differentiation engendered by expanding organizational size increasingly impinges upon the savings in

administrative manpower that a large scale of operations realizes.

Two unmeasured concepts of intra-unit homogeneity and inter-unit heterogeneity can be utilized to further explain the two separate effects that increasing organizational size has upon the administrative overhead (Appendix 3). Blau elaborates upon the significance of these two concepts:

The pronounced differentiation of responsibilities in large organizations enhances simultaneously intra-unit homogeneity and inter-unit heterogeneity. Inasmuch as duties are more differentiated and the amount of work required in most specialities is greater in large organizations than in small ones, there are comparatively many employees performing homogeneous tasks in large organizations. The large homogeneous personnel components in large organizations simplify supervision and administration, which is reflected in a wider span of control of supervisors, and a lower administrative ratio in large than in small organizations. Consequently, organizations exhibit an economy of scale in administrative manpower. At the same time, however, the heterogeneity among organizational components produced by differentiation creates problems of coordination and pressures to expand the administrative personnel to meet these problems.¹³⁷

In summary, the increases in organizational size produces two major effects upon the administrative component. First, it lowers the ratio due to the economies of scale in supervision. Secondly, it raises the

¹³⁷ Blau, Ibid., p. 218.

administrative ratio indirectly through the structural differentiation that it generates.

In summary, this chapter provided a review of the literature on research studies which focused on the organizational variables of size and administrative ratios. It was noted that definitional ambiguity of administrative components, the lack of theoretical frameworks, and the absence of a well-defined conceptualization of organizational structure were quite apparent in the related research.

Additionally, it was noted that the dynamics of organizational structure was not accounted for in these studies. Subsequently, most studies dealt with a minimum of organizational variables. Based on the analytical framework of Blau, and utilizing the Aston conceptualization of organizational structure, a rationale was provided to explore the exact nature of variances of administrative ratios. From the rationale two research hypotheses were derived identifying the exact nature of the relationships that increasing organizational size and structural differentiation have with varying administrative ratios.

The next chapter, Experimental Design, will describe sample selection, instrument construction, scoring methods, study and statistical designs.

CHAPTER II

EXPERIMENTAL DESIGN

This chapter describes the sample that was selected for investigation. The specific methods used and procedures followed in the construction of the instrument are then provided. Next, the adopted procedures for the administration of the research instrument are described. This is followed by a brief description of scoring methods used and the chapter concludes with an elaboration of the study and statistical design.

1. Sample Description.

In determining the population to be studied, the Province of Ontario was selected to represent the broad parameters for study. The rationale was that the school boards would be "[...] performing the same general function and circumscribed by much the same legislation and directives"¹.

The Province of Ontario is divided into nine Regional Divisions containing 192 School Boards. The

¹ The Education Act 1976, Ontario Ministry of Education, Toronto, J. C. Thatcher, Queen's Printer for Ontario, 1976.

distribution of Ontario School Boards by educational region and type is presented in Appendix 5.

From the entire set of 192 school boards, only two major types, Boards of Education and Roman Catholic Separate School Boards, were selected for investigation. The basis for the selection of the population to include only two major types of school boards resulted from five general observations. These served to delimit the total number of Provincial boards.

1. Representativeness in all nine educational regions.

2. Types with different financial resources (unequal financial ceilings) were excluded.

3. Boards which operate only one school were excluded.

4. Boards which operate without any permanent pupil membership were excluded.

5. Boards of Education and the Catholic Separate School Boards were evenly distributed over the pupil size continuum utilized by the Ontario Ministry of Education².

In addition to the above, an attempt was made to control for both the age and growth rates of school boards

² Educational Statistics, Ontario Ministry of Education, J. C. Thatcher, Queen's Printer for Ontario, Toronto, p. 3-112.

to be included in the sample. Consequently, boards which were unaffected by the reorganization Legislation of January 1, 1969³, and experienced consistently decreasing pupil enrolments of five percent or more over a four year period⁴, were excluded from the study.

The information required to delimit the universe of school boards using the criterion 'decreasing enrollments' was obtained through the offices of the Ministry of Education, in Toronto.

Resultant upon the application of the previously mentioned criteria, the population exhibited the following features:

1. Minimal technological variation.
2. Minimal variation in financial resources.
3. Minimal variation in life spans.
4. Minimal variation in growth patterns.
5. Geographical representativeness, and
6. Even distribution over the provincial size continuum.

3 W. G. Fleming, The Administrative Structure of Ontario's Educative Society, Toronto, University of Toronto Press, 1971, p. 122.

4 William Starbuck, "Organizational Growth and Development", in James G. March, (ed.), Handbook of Organizations, Chicago, Rand and McNally, Limited, 1968, p. 484.

In addition to the above, the school boards that were formed in 1969, either through integration or consolidation, offer potential advantages relative to any study that attempts to deal with their structural dimensions. This uniqueness is reflected in the degree to which the contextual variables that serve as determinants of structural characteristics are controlled partially or totally.

The framework of operationally defined and empirically validated concepts of organizational context that identifies the setting in which the school board administrative units have probably developed since the reorganization of 1969 were presented in Chapter I. Pugh and his associates utilized seven of these concepts to test as predictors of structural variables. The predictors in their study were: a) Origin and History, b) Ownership and Control, c) Charter, d) Size, e) Technology, f) Location, and g) Dependence⁵.

The sample of 98 boards, 53 Boards of Education, and 40 Roman Catholic Separate School Boards, comprising 95 percent of the student population constitute a homogeneous set of boards.

The homogeneity of these boards specifically refers to the fact that they exhibit minimal variations on the factors enumerated by Pugh and his associates.

5 D. S. Pugh et al., "A Conceptual Scheme for Organizational Analysis", Administrative Science Quarterly, Vol. VIII, No. 3, September 1963, p. 289-315.

The Ontario Boards of Education and the Roman Catholic Separate School Boards operate elementary and secondary, and solely elementary school systems respectively. Therefore, these boards will be designated as "combined" and "elementary" for purposes of future discussions.

2. Instrumentation.

An important concern in research is the choice of an appropriate data-gathering procedure. For purposes of this study the questionnaire method was preferred to the personal interview technique for the following reasons:

1. The geographical distribution of the Ontario Boards of Education and the Combined County and District Roman Catholic Separate School Boards made the personal interview technique less favourable than otherwise would be the case.

2. The impersonal nature of the questionnaire — its standardized wording, its standardized order of questions, its standardized instructions for wording responses — ensures some uniformity from one measurement situation to another⁶.

Since a suitable standardized instrument was not available for purposes of this research, it was necessary

⁶ Claire Seltiz et al., Research Methods in Social Relations, New York, Holt, Rinehart and Winston, Incorporated, 1961, p. 238-241.

to construct an appropriate questionnaire. The development of the research instrument, SCHOOL BOARD QUESTIONNAIRE, (SBQ) will be discussed next.

The three variable designs of this study — organizational size, administrative component ratio, and organizational complexity — necessitated the construction of three major parts of the SBQ. These are identified as: Part I — Organizational Size; Part II — School Board Personnel; and Part III — Complexity (see Appendix 5).

The specific procedures followed in the construction of the SBQ will be discussed under the separate parts just outlined.

Part I — This part of the instrument was aimed at ascertaining an index of school board size. Comparisons of the definitions for the organizational size variable (Appendix 1) of related studies indicated the lack of a clear-cut definitional taxonomy for the size variable. Related studies, in education, differed in the extent to which they utilized one or more of the following indices of organizational size: a) total number of employees, b) total number of teachers, c) pupil membership, and d) number of schools.

The greatest amount of agreement, across different organizational studies, was achieved when the various

definitions were examined using total organizational membership and/or employment as a common denominator. This was especially true for studies that investigated school systems.

Based on what agreement there was for the organizational size variable, and to facilitate comparisons of this study's findings with other school systems, measures were obtained on four indices of school board size. These were: a) total number of employees, b) total number of teachers, c) pupil membership, and d) number of schools.

These data for the four indices of organizational size, thus obtained for the sample of school boards, constituted the measurements for the variable of organizational size. The correlations between the four measures of school board size are presented in Table I. All measures of organizational size were highly intercorrelated. Consequently, all measures appeared suitable as indices of school board size. However, total number of employees was judged the most appropriate for the following reasons:

1. The total number of employees is an index of size over which school boards can exercise some control. Pupil membership, on the other hand, is an index of size subject to population density and mobility.

2. The total number of teachers and number of schools, as measures of school board size, were not

Table I
Correlation Matrix for School Board Size Indicators
(N=39)

	Number of Employees	Number of Teachers	Number of Schools	Number of Pupils
Number of Employees	1.000	0.8467	0.8321	0.8686
Number of Teachers		1.0000	0.9172	0.9637
Number of Schools			1.0000	0.9686
Number of Pupils				1.0000

consistent with the definition of the contextual variable size of the Aston conceptualization that was adopted for this research and defined in Chapter I.

The data obtained on the 'total adult employees' definition of organizational size was adopted as the empirical measure for the variable of school board size for this study.

Part II — This particular part of the SBQ was focused on determining an accurate account and the location of adult personnel occupational types employed by the Ontario school boards. A comparative examination of research studies utilizing a definition for the administrative component revealed considerable divergence and ambiguity. This is especially true when viewing a variety of organizational types. The one general conclusion reached from reviewing the definitions displayed in Appendix 1 was that none clearly specified the make-up of the administrative component. No agreement existed about the definition of the administrative component. Furthermore, since most definitions lacked specificity, it seemed advisable to accept the conceptualization that administrative tasks are vested in and implemented through specific offices (occupational types).

The lack of definitional agreement provided the impetus to capitalize upon the methodology of the

University of Alberta researchers^{7,8}, namely, that of establishing multiple definitions for the administrative component. Consistent with this approach, information on specific categories of school board personnel was obtained and led to the development of the classificatory scheme outlined in Chapter I. The classificatory scheme of school board personnel is as follows:

School Board Personnel

1. Administrative: — the top position at each of the central office, intermediate, and school levels.
2. Intermediate: — the immediate position on the next hierarchical level to superordinates at top positions.
3. Supervisory: — persons charged with direct responsibility of over-seeing curriculum development, and instructional supervision.
4. Auxiliary: — persons charged with the direct responsibility of providing special services to promote student welfare.

7 Edward A. Holdaway and Keith A. Vithayathil, "Administrative Staff and School System Size", Canadian Administrator, Vol. VIII, No. 4, October 1968, p. 1-4.

8 Edward A. Holdaway, "Staffing Metropolitan School Districts", Canadian Administrator, Vol. X, No. 7, April 1971, p. 30.

5. Clerical: — persons charged with no supervisory duties, whose sole responsibilities relate to typing, writing and recording.

6. Service: — persons charged with responsibilities of general upkeep and cleaning of board facilities or providing transport and cafeteria services.

7. Production: — persons directly involved with students at the classroom level.

Three definitions of the administrative component were constructed in terms of the above-mentioned specific categories of the school board personnel classificatory scheme. The classificatory scheme is consistent with the glossary of educational personnel titles for the Province of Ontario⁹.

The three definitions were carefully constructed to reflect a range that included one with a narrow interpretation of the administrative component to one extremely broad. This specific procedure allowed for an appropriate testing of the applicability of Blau's "managerial complement"¹⁰ declining ratio. In addition, it allowed the

9 The Education Act, 1976, Ontario Ministry of Education, Toronto, J. C. Thatcher, Queen's Printer for Ontario, 1976.

10 Peter M. Blau, "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 204-205.

flexibility for this researcher to test the applicability of Blau's propositions to personnel complements other than top administrative officials. Definition I was constructed to consist of top administrative officials, thus becoming the most restrictive or basic definition of administrative component. The first definition lent itself to a test of the main principle of this study. Definition II incorporated definition I and was extended to include the intermediate personnel. Definition III incorporated definition II and was extended by the addition of supervisory personnel. The latter definition represented the broadest interpretation of the makeup of the administrative component for this study.

The exact makeup of the administrative component was of major importance for the study. The number of personnel encompassed by each of the above definitions is only meaningful when expressed in ratio form. Therefore, administrative ratio, for purposes of this study, was defined as the ratio of the number of personnel in the administrative component to the index of school board size (number of adult personnel). The ratio was computed by dividing the number representing the administrative component by the number representing the size of the school board.

The utilization of three definitions of the administrative component resulted in three administrative component ratios. These ratios, when computed, became the operational measures for the administrative ratio variable.

Part III — The last part of the SBQ was developed directly from the four major components of the concept complexity as conceptualized by Hass, Hall and Johnson (1967) and as outlined in Chapter I.

Hass, Hall and Johnson used the term complexity to cover more dimensions that did their predecessors. The basis for the adoption of these indicators of complexity resulted from their apparent ability to incorporate the various dimensions suggested in the literature: for example, supervisory attention (Udy, 1959)¹¹; coordination (Anderson and Warkov, 1959)¹²; occupational specialization (Hage, 1963)¹³; division of labor (Rushing, 1967)¹⁴;

11 Stanley U. Udy, Jr., "'Bureaucracy' and 'Rationality' in Weber's Theory", American Sociological Review, Vol. XXIV, No. 4, December 1959, p. 791-795.

12 Theodore R. Anderson and Seymour Warkov, "Organizational Size, and Functional Complexity: A Study of Administration in Hospitals", American Sociological Review, Vol. XXVI, No. 1, February 1961, p. 23-28.

13 Jerald Hage, "An Axiomatic Theory of Organizations", Administrative Science Quarterly, Vol. X, No. 3, December 1965, p. 294.

14 W. A. Rushing, "The Effects of Industry Size and Division of Labor on Administration", Administrative Science Quarterly, Vol. XII, No. 1, June 1967, p. 273-295.

diversification of major objectives and departmental specialization (Heydebrand, 1967)¹⁵, and location (Pugh et al., 1963)¹⁶.

Complexity is an attribute of the total organization; a dimension along which organizational configuration varies¹⁷. It implies what Rushing called "structural differentiation and individual differentiation, i.e., division of labor"¹⁸. It also includes, as one of its components, the geographical location variable of Anderson and Warkov¹⁹. Hass, Hall and Johnson's complexity definition seemed applicable for use in this study of school board structure. It is congruent with Blau's (1970) concept of differentiation²⁰.

Consequently, Hass, Hall and Johnson's definition was adopted for use in this research. Complexity then is defined as:

15 W. V. Heydebrand, "The Architecture of Complexity", Social Science Information, Vol. XII, October 1967, p. 50-58.

16 Pugh et al., Op. Cit., p. 289.

17 Ibid., p. 306.

18 Rushing, Op. Cit., p. 294.

19 Anderson and Warkov, Op. Cit., p. 27.

20 Blau, Op. Cit., p. 207.

[...] the degree of internal segmentation -- the number of separate 'parts' of the organization as reflected by the division of labor, number of hierarchical levels, and the spatial dispersion of the organization.²¹

Hass and his colleagues utilized eleven indicators of complexity for organizational analyses. These indicators were modified with specific interpretation to improve the applicability to what was being measured in the Ontario school boards. An acknowledgement is made to Hass and his colleagues for their operational definitions of the concept "complexity". For purposes of comparison and reference, they are reproduced in Appendix 2.

The operational definition (indicators of complexity), together with interpolation and measurement specifications, as utilized in this study, are as follows:

1. Division of Labor - General — The presence of one or more organizational activities. The empirical measure is the score of one for the presence of each of a multiplicity of diverse educational programs.
2. Division of Labor - Specific — a) The presence of one or more major departments or divisions. The empirical measure is the number of departments or divisions that were formally constituted in the school board structure. b) The presence of specialized departments

²¹ Hass, Hall and Johnson, Op. Cit., p. 906.

(number of distinct subdivisions under major departmental headings). The empirical measure is the frequency count of the number of subunits within the most specialized department. c) Mean intradepartmental subdivision (the total number of subdivisions divided by the number of departments). A mean score for each school board is determined by taking a frequency count of the number of distinct subdivisions and dividing this by the number representing a frequency count of the organization's total number of departments.

3. Spatial Dispersion — a) The degree to which physical facilities are spatially dispersed. The empirical measure is the number of independent facilities (schools) of the school board. b) The degree to which personnel are spatially dispersed. The empirical measure is the number of personnel physically removed from the central office headquarters of the school board.

4. Hierarchical Differentiation — a) The number of levels in the deepest single department of the school board. The empirical measure is the number of levels in the deepest single department. b) The mean number of hierarchical levels for the school board as a whole. The empirical measure is the sum of the number of hierarchical levels within all departments divided by the number of departments.

The data obtained on the four separate components of the concept "complexity" are converted to standard scores. Means of the individual component indicators are then calculated and summed to provide the operational measure for the complexity variable.

In the construction of Parts I and II of the SBQ and in the adoption of Hass, Hall and Johnson's (1967) complexity components for Part III, two major problems were encountered: a) variable substitutions, deletions, and additions to the complexity indicators, and b) semantic difficulties and ambiguities arising from changes and the construction of items.

These two problems were treated on two levels. First, a careful review of the literature dealing with the development of large administrative units in Ontario's educational structure^{22,23} resulted in the acquisition of a sufficient body of knowledge relating to the terminology of school board structures that was indispensable in the construction of the questionnaire.

22 Documentary History of Education in Upper Canada, Ontario, Vol. XXII, 1869-1871, L. K. Cameron, King's Printer, 1908.

23 The Reorganization of School Jurisdictions in the Province of Ontario, Vol. I: A Guide for Northern Ontario, and Vol. II: A Guide for Southern Ontario, Ontario Department of Education, Queen's Printer, Toronto, 1968.

Secondly, the problem was met by administering the first draft to selected Master's students in educational administration at the University of Ottawa during July 1976. The graduate students scrutinized the questionnaire in order to ensure that variable substitutions and additions made by the researcher were in keeping with the purpose of the instrument. The first scrutiny was also aimed at having the graduate students identify possible semantic difficulties both in the instructions and questions of the instrument.

On the basis of this scrutiny, a second form of the SBQ was developed. This form was then subjected to the scrutinization of professors and full-time doctoral students in the Department of Educational Administration, Faculty of Education, University of Ottawa, Ottawa.

This form was also administered to two directors, an associate director, a business director, and a director of instructional services of five different Canadian school boards. The suggestions made by these individuals were considered in constructing the final draft of the instrument.

As a result of the scrutiny by the: a) graduate class in educational administration, b) the professors in the Department of Educational Administration, and full-time

doctoral students at the University of Ottawa, and c) five separate school board administrative officials, there were three major modifications made to the original draft:

1. A section was developed to identify specific characteristics of the two types of school boards included in the sample.

2. Examples and illustrations were built into the separate complexity indicators of the complexity part of the SBQ. This was designed to both help clarify the intent of the structural terminology, and to ensure a higher degree of uniformity and consistency in the subjects' responses.

3. The separate complexity components of Division of Labor-Specific and Division of Labor-General were more highly structured. This modification was designed to provide for the acquisition of more specific information than had been requested by Hass, Hall and Johnson (1967).

The specific methods and procedures adhered to in the formulation of the research instrument, SBQ, should justify using it as a valid data-gathering instrument.

3. Administration of Questionnaire.

The SBQ was administered during the months of August and September, 1976. Mailing information was obtained from the Ontario School Board Directory, 1975-76.

A personal cover letter was included with the questionnaire packet explaining the importance of the study and soliciting the assistance of each school board director and/or his research department. Directors were requested to complete and return the questionnaire in a stamped, self-addressed envelope. The initial response was twenty-nine completed questionnaires. In response to a follow-up questionnaire, eight more were returned. A second follow-up letter produced five additional questionnaires making a total of forty-two completed questionnaires. Table II provides a school board type breakdown of questionnaires mailed, the number of subjects who responded, and the number and percent of usable returns.

From the ninety-eight questionnaires mailed, fifty-three subjects responded. Out of the fifty-three responses, eleven subjects indicated that they did not wish to participate in the study, and from the remaining forty-two questionnaires, thirty-nine usable returns resulted and constituted the total sample for this investigation.

A comparison of the identification data on the thirty-nine school boards who did participate in the study

Table II
School Board Breakdown of Sample Returns

School Board Type	Number of Questionnaires Mailed	Number of Questionnaires Returned	Number of Usable Returns
Combined	58	27	24
Elementary	40	15	15

with available identification data on the initial ninety-eight subjects did not reveal biases in the sample returns. Thus, the findings of the study could be tentatively generalized to the rest of the population within the Province of Ontario.

4. Method of Scoring.

A problem in the scoring centered in Part III of the SBQ. The problem related to the fact that the separate complexity indicators represented only portions of the total score for each of the major components. Consequently, there was a need to arrive at total complexity scores for each of the four major components of complexity. This step had to be completed before a composite complexity score could be obtained for each school board in the sample. The individual indicators under each major component contained the properties of interval data: a) equal distance²⁴, and b) capable of being ordered²⁵. However, the scales for each component were different; therefore, they were, of necessity, converted to standard form. Guilford provided

²⁴ H. E. Klugh, Statistics: The Essentials for Research, New York, John Wiley and Sons, Incorporated, 1974, p. 8.

²⁵ Bernhart Lieberman, Contemporary Problems in Statistics: A Book of Readings for the Behavioral Sciences, New York, Oxford University Press, 1971, p. 6.

the procedure to be followed by which the total numbers obtained from frequency counts were converted to standard (T) scores²⁶.

Another obstacle presented itself. This related to the fact that the four major components were composed of unequal numbers of scales. One method of reducing the inequality among the four major components of the total complexity score was to take the mean of the scale T-scores before summing for a total complexity measure. This was done and intercorrelations were calculated among the four major components as well as among the parts with the total complexity score. The results of this operation are reported in Chapter III, Presentation of the Results.

5. Study and Statistical Design.

This study was a descriptive, causal-comparative one having an ex post facto design. It attempted to search for likenesses and differences among subjects concerning the direct and indirect effects of size. It attempted to ascertain the exact relationships between these effects and the occurrence of small and large administrative component ratios in selected Ontario school boards.

26 J. P. Guilford, Fundamental Statistics in Psychology and Education, New York, McGraw-Hill, Incorporated, 1965, p. 518-521.

An underlying assumption of the study was that if size, operating through the division of labor, creates structural differentiation as a consequence of increasing organizational size, it would manifest itself in school board structures that differed along a continuum of size in a cross-sectional study.

The sample, school boards, was divided into three groups on each of the two independent variables, organizational size, and organizational complexity. Means and standard deviations of administrative component ratios for the size groupings of small, average and large and for the complexity groupings of low, medium and high were calculated.

The FRULM Program was utilized for purposes of this study. Analysis of variance testing was applied to the three administrative ratios across both sets of subgroupings of the two independent variables, organizational size and complexity. The Scheffé post hoc analysis for significant differences and significant interaction was employed. The level of statistical significance was set at the .05 level, and the two hypotheses were tested in the null form.

In summary, this chapter identified the research population as the 192 Ontario school boards from which the sample was drawn. The population was delimited to two major types through the operationalization of both specific and general criteria previously mentioned. Emphasis was

placed upon the methods and procedures utilized in the construction of the instrument, SBQ. The manner of questionnaire administration and scoring were described next. Finally, a presentation of the study design and statistical procedures utilized to test the null hypotheses were provided.

The following chapter will present a brief examination of the data obtained by the research instrument on each of the three variables of this study as well as the results of the statistical tests.

CHAPTER III

PRESENTATION OF THE RESULTS

This chapter reports the results of the present study. The results are arranged in five sections. An examination of the data obtained by the research instrument on each of the three variables of this study — organizational size, administrative component ratios, and organizational complexity — comprises the first section. Each variable is discussed independently. Section two provides an examination of the interrelationships among the variables of the study. Sections three and four present statements of the null hypotheses followed by a presentation of the data pertaining to each hypothesis and the statistical decision made as a result of that data. The chapter concludes with a brief outline of the main findings in section five.

1. Examination of Variable Data.

The examination of the variables is necessary to see what the data look like across the total sample of thirty-nine school boards. The procedures utilized and decisions made in dividing the independent variables of organizational size and organizational complexity will be discussed under the appropriate subheadings.

Organizational Size — One measure of school board (organizational) size was utilized in this study: total number of adult personnel employed by a school board.

The total sample of thirty-nine school boards ranged in size from thirty-one to 4,000 adult employees which were distributed as shown in Appendix 6.

If the total sample is divided into school board type, it includes: a) twenty-four combined boards with an employee range of eighty-eight to 4,000, and b) fifteen elementary boards having an employee range of thirty-one to 700.

The total personnel range for the thirty-nine school boards of the sample were divided into three size designations with personnel ranges as follows: 1) Small (N=13), 1-200; 2) Average (N=16), 201-1000; and 3) Large (N=10), 1001-4000.

The basis for the division of the total sample stemmed from frequency distributions of the raw data and from an examination of school boards as they exist in the Province of Ontario.

Administrative Component Ratios — Three definitions of the school board administrative component variable were defined for purposes of this study. These were: 1) Definition I: — top administrators, 2) Definition II: — top administrators plus intermediate personnel, and 3)

Definition III: — top administrators, intermediate personnel and supervisory personnel. The raw data distribution of numbers of personnel for each of the three definitions of the administrative component is presented in Appendix 7.

The range interval and length for each of the three administrative component definitions by school board type are presented in Table III. Definition I is the most restrictive definition of the administrative component. The addition of supervisory personnel makes a significant difference in the absolute size of the administrative component when comparing Definitions I and II with III.

The rationale underlying the development and utilization of administrative component definitions which vary in their degree of restrictiveness was presented in Chapter II.

Ranges for the administrative component using school board type were similar to those obtained for the school board size variable. Combined boards had a larger number of personnel making up all of the different definitions of the administrative component than did the elementary school boards.

As mentioned in Chapter II, the membership of the administrative component was only meaningful when expressed in ratio form. Administrative component ratio was defined as the ratio of the size of the administrative component

Table III

Adult Personnel Range Intervals and Lengths
for the Administrative Component Definitions

Definitions	School Board Type			
	Combined		Elementary	
	Interval	Length	Interval	Length
Administrative Component Definition I: — Number of Top Administrators	7-95	88	3-37	34
Administrative Component Definition II: — Number of Top Administrators Plus Intermediate Personnel	9-148	139	4-48	44
Administrative Component Definition III: — Number of Top Admin- istrators, Intermediate, and Supervisory Personnel	18-379	361	4-76	72

to the size of the school board. The ratios were computed by dividing the number representing the absolute size of the administrative component by the number representing the size of the school board. The distribution of the computed ratios of size of administrative component to employee size according to administrative component definitions is displayed in Appendix 8. This is followed by a one-way analysis of variance table and Scheffé post hoc analysis in Appendix 9. To provide a test of the applicability of Blau's theory of the "declining complement"¹ it was imperative that the three administrative component ratios be significantly different in their degrees of restrictiveness. The three ratios were found to be significantly different at the .001 confidence level.

The mean percentages and standard deviations of administrative component ratios by individual administrative component definitions for the entire sample are presented in Table IV. An examination of the data in Table IV reveals that the addition of the supervisory personnel complements of school boards results in the greater increase in the administrative component ratio size. The intermediate personnel constitute approximately 2.5 percent of the total

¹ Peter M. Blau, "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 201-217.

Table IV

Administrative Component Ratio Mean Percentages
and Standard Deviations for Entire Sample

Administrative Component Ratios	Ratio Scores	
	Mean Percentages	Standard Deviations
Ratio I	5.35	1.79
Ratio II	7.85	2.42
Ratio III	12.01	4.21

number of employees for the sample of school boards. The supervisory personnel constitutes approximately 4.16 percent of total school board employees.

Organizational Complexity — The complexity variable for purposes of this study was defined as the degree of "internal segmentation"². The necessity of utilizing standard scores (T-scores) for the complexity measures, adopted for use in this study, was discussed in Chapter II. The distribution of the four separate complexity components and their totals is presented in Appendix 10.

Part of the discussion concerning the complexity measures presented in Chapter II related to the total complexity score for each school board in the sample.

Two methods of assessing the contributions of the separate complexity components seemed appropriate.

The first method was through an inspection of the distribution of complexity scores (T-scores) in Appendix 10. This inspection was used to determine the amount of spread within each of the four complexity components, and finally the total complexity score. In this regard:

² Eugene Hass, Norman Johnson and Richard M. Hall, "Organizational Size, Complexity, and Formalization", American Sociological Review, Vol. XXXII, No. 6, December 1967, p. 903-912.

Section A: — (Division of Labor-General) exhibited the greatest range, with a spread of 42.4 standard scores from 33.7 to 76.1.

Section B: — (Division of Labor-Specific) had the smallest range, with a spread of 34.3 standard scores, from 33.4 to 67.7.

Section C: — (Spatial Dispersion) had the next smallest range, with a spread of 38.2 standard scores, from 30.8 to 69.0.

Section D: — (Hierarchical Differentiation) had the second greatest range, with a spread of 40.2 standard scores, from 32.9 to 73.1.

When the four measures of the separate complexity components were summed to obtain a total complexity score for each school board in the sample, the range was from 145.1 to 289.5, or a spread of 144.4 standard scores.

The second method utilized to examine the contributions of the four separate components to the total complexity measure was guided by obtaining Pearson product-moment correlations. The results of this procedure are presented in Table V. All of the four components had high correlations with each other and the total. It would appear that if one complexity component is a measure of complexity, then they all are. Consequently, the total complexity measure is representative of its parts; as such,

Table V
Complexity Measure Correlation Matrix

	Part I: Division of Labor-General	Part II: Division of Labor-Specific	Part III: Spatial Dispersion	Part IV: Hierarchical Differentiation	Total Complex- ity Score
Part I: Division of Labor-General	1.0000	.6705	.4115	.4825	.7307
Part II: Division of Labor-Specific		1.0000	.6831	.7757	.8979
Part III: Spatial Dispersion			1.0000	.7423	.8200
Part IV: Hierarchical Differentiation				1.0000	.8868
Total Complexity Score					1.0000

it is useful as an index of complexity in the sample of school boards. The complexity score interval and range by school board type is presented in Table VI.

Using only the total complexity score as the index, combined boards had an interval of 165.1 to 289.5, or a range of 124.5 standard scores. Elementary boards had an interval of 145.1 to 206.6, or a range of 61.5 standard scores. These data reveal that the combined boards tend to be larger and more complex than elementary boards.

In summary, the distribution of the raw data obtained by the SBQ for the independent variables of organizational size and organizational complexity and the dependent variable of administrative component ratios reveal that the combined boards exhibited the greatest employee range for all three administrative component definitions. Additionally, the most complex boards tended to be combined boards of education.

The following section will discuss the relationships among the three variables of this study.

Table VI

Complexity Means, Intervals and Lengths by
School Board Type for Entire Sample

School Board Type	Complexity Scores		
	Mean	Interval	Length
Combined (N=24)	210.4	165.1-289.5	124.5
Elementary (N=15)	182.7	145.1-206.6	61.5

2. Relationships of Variables.

Each variable was viewed independently in the preceding section. Now the interrelationships between the variables, organizational size, administrative component ratios, and organizational complexity, will be examined.

The initial procedure used to examine the interrelationships between the variables was to inspect the administrative component mean percentages and standard deviations by definition for the three levels of school board (organizational) size. This is followed by a definition of complexity levels for the small, average and large sized school boards. The complexity levels computed are then compared to the administrative component ratios for the small, average, and large sized school boards. The presentation of the data that will serve as the basis for the discussion of the variable interrelationships will be provided in Tables VII to IX.

Administrative Component Ratios-Organizational Size —
The nature of the relationship between the variables organizational size and administrative component ratios is of central concern in this study. The specific nature of this relationship is to be tested through hypothesis 1.

The administrative component ratios and standard deviations for the three administrative component

definitions according to school board size are illustrated in Table VII.

Inspection of the data in Table VII suggests that large Ontario school boards have a smaller proportion of their personnel in administration than do either average or small sized school boards. The directional tendency for administrative component ratios between small and large school boards is toward an inverse relationship. This directional tendency is manifest in all three administrative component definitions utilized in this study. Consequently, the notion that, as organizations increase in size, there is an inverse relationship between the size of the administrative component and the size of the organization, appears to be supported. However, this support must be viewed tentatively until the testing of the hypothesis. The support for the inverse relationship is presently just through an examination of the administrative component ratio mean percentages.

Organizational Size and Complexity — The nature of the relationship between the variables organizational size and organizational complexity does not constitute a pivotal concern in this study. However, it is important that the nature of this relationship be investigated in so far as it may shed some light on the nature of the relationships between the other possible sets of variable relationships.

Table VII

Administrative Component Mean Percentages Based on
Total Adult Personnel for Small, Average and Large
Sized School Boards for Entire Sample

School Board Size Designa- tion	Number in Group	Size Range	Administrative Component Mean Percentages: Definitions:		
			I	II	III
Small	13	1-200	7.33	10.20	13.73
S.D.			1.36	1.61	3.91
Average	16	201-1000	4.64	7.54	11.65
S.D.			0.74	1.57	3.05
Large	10	1001-4000	3.76	5.45	10.35
S.D.			0.82	1.60	5.51

The total complexity score interval and spread for the school board sized designations of small, average and large are presented in Table VIII.

An examination of the complexity ranges for small, average, and large school boards appears to warrant the observation that average sized school boards are not necessarily more complex than small school boards. Additionally, large school boards are not necessarily more complex than are average sized school boards. The total complexity scores by small, average and large sized school boards were subjected to the one-way analysis of variance test followed by the Scheffé post hoc analysis. The analysis of variance Table and the Scheffé post hoc analysis Table are contained in Appendix 11.

The data tested at the .05 level of confidence revealed that there are no significant differences between the complexity levels of small and average sized school boards. However, the large sized school board complexity levels are significantly higher than the average sized school board complexity levels.

Consequent upon the testing of differences between the three size designations, the results indicate that perhaps researchers who deal with organizational analysis would do well to question the generally held assumption that

Table VIII

Size Ranges, and Total Complexity Score Interval,
Mean, and Standard Deviations for Small, Average
and Large Sized School Boards for Entire Sample

School Board Size Designa- tion	Number in Group	Size Range	Complexity Score	
			Interval	Mean
Small S.D.	13	1-200	145.1 - 206.6	179.30 17.91
Average S.D.	16	201-1000	167.8 - 213.1	193.48 13.76
Large S.D.	10	1001-4000	176.6 - 289.5	236.29 30.23

larger sized organizations are necessarily more complex than are small sized organizations.

Next, the relationship between administrative component ratios and complexity will be examined prior to the testing of the null hypotheses of this study.

Administrative Ratios and Complexity — The second major concern of this study relates to the nature of the relationship between the variables, organizational complexity and the administrative component ratios.

The total complexity score and administrative component ratio means and standard deviations by size designations of small, average and large school boards are illustrated in Table IX.

It was earlier noted that significant differences exist between the complexity levels of average and large sized school boards but not between small and average sized school boards.

The figures in Table IX reveal that the largest decrease in administrative ratio means for the three administrative component ratios from small to average size school boards accompanies the non-significant increase in complexity from small to average sized school boards. The smallest decrease in administrative ratio means for all administrative component ratios is from average to large

Table IX

Mean Total Complexity Scores and Administrative Component Means and Standard Deviations by School Board Size Designations

School Board Size Designa- tion	Number in Group	Size Range	Complexity Score	Administrative Component Definitions:		
				I	II	III
Small	13	1-200	179.30	7.33	10.20	13.73
S.D.			17.91	1.36	1.61	3.91
Average	16	201-1000	193.48	4.64	7.54	11.65
S.D.			13.76	0.74	1.57	3.05
Large	10	1001-4000	236.29	3.76	5.45	10.35
S.D.			30.23	0.82	1.60	5.51

sized school boards, yet, average and large sized school boards reflect significant differences in complexity levels.

Consequently, this brief examination of the raw data for the two variables, administrative ratios and complexity, within and between school board size designations of small, average and large, could be interpreted as lending support for this writer's contention; namely, that complexity might be influencing the decrease in the rate of decrease of mean administrative ratios from small to large sized organizations.

For purposes of testing the hypothesis of this study, the raw data was reduced to administrative component ratio means. The analysis of the data was basically executed upon the cell means as presented in Table X.

The results of testing the two hypotheses of this study will be presented next.

3. Results of Testing the First Hypothesis.

The first hypothesis stated that the mean administrative ratios of small sized school boards are larger than that of either average or large sized school boards. This was tested by utilizing the analysis of variance statistical test to obtain F-values for size main effects. The testing was applied to each of the three administrative ratio measures previously defined. The application of the

Table X
Cell Frequencies and Estimated Means* and
Marginal Means* for all Administrative Ratios

SIZE	COMPLEXITY			
	Low	Medium	High	
Small	(N - 6)	N - 3	N - 4	N - 13
	$M_1 = 8.51$	$M_1 = 6.42$	$M_1 = 6.25$	$M_1 = 7.33$
	$M_2 = 11.01$	$M_2 = 8.45$	$M_2 = 10.30$	$M_2 = 10.20$
	$M_3 = 12.49$	$M_3 = 13.38$	$M_3 = 15.86$	$M_3 = 13.73$
Average	N = 6	N = 4	N = 6	N = 16
	$M_1 = 4.85$	$M_1 = 4.63$	$M_1 = 4.44$	$M_1 = 4.64$
	$M_2 = 7.47$	$M_2 = 6.95$	$M_2 = 8.07$	$M_2 = 7.54$
	$M_3 = 12.64$	$M_3 = 11.33$	$M_3 = 10.87$	$M_3 = 11.65$
Large	N = 4	N = 3	N = 3	N = 10
	$M_1 = 2.98$	$M_1 = 4.14$	$M_1 = 4.41$	$M_1 = 3.76$
	$M_2 = 6.08$	$M_2 = 5.71$	$M_2 = 4.37$	$M_2 = 5.45$
	$M_3 = 10.16$	$M_3 = 13.01$	$M_3 = 7.95$	$M_3 = 10.35$
	$M_1 = 5.75$	$M_1 = 5.02$	$M_1 = 5.52$	
	$M_2 = 8.45$	$M_2 = 7.02$	$M_2 = 7.90$	
	$M_3 = 11.96$	$M_3 = 12.45$	$M_3 = 11.73$	

* M_1 = Cell or marginal mean for administrative ratio I.

M_2 = Cell or marginal mean for administrative ratio II.

M_3 = Cell or marginal mean for administrative ratio III.

Scheffé post hoc examinations revealed the exact location of significant differences. The results supported the hypothesis for Ratio I, and Ratio II, but not for Ratio III. The statistical data for the hypothesis applied separately to each administrative ratio are presented in Tables XI to XIII.

4. Results of Testing the Second Hypothesis.

The second hypothesis stated that there is a size-complexity interaction as it affects administrative ratios. Specifically, the difference between mean administrative ratios of small sized, low complexity and large sized, low complexity school boards is different than that between small sized, high complexity and large sized, high complexity school boards. The results supported the hypothesis for Ratio I, but not for Ratios II and III. The analysis of variance testing for significant size-complexity interaction is presented in Tables XI to XIII.

5. Main Findings.

The main findings of the analysis of the data obtained in this study were as follows:

1. There were significant differences for the means of administrative Ratios I and II between school board size designations of small and large and between the school board

Table XI

Overall Hypotheses Tests for Ratio I

Sources of Variation	Number of Degrees of Freedom	Sum of Squares	Mean Square	F-value
C	2	1.44	0.72	1.32 N.S.
S	2	64.39	32.19	59.08 *
SC	4	17.15	4.29	7.87 *
error	30	16.35	0.54	

Scheffé post hoc test.^a

95% confidence intervals for S:

$$2.40 \leq \psi_1 \leq 4.03 *$$

$$1.69 \leq \psi_2 \leq 3.15 *$$

95% confidence intervals for SC:

$$1.26 \leq \psi_3 \leq 6.11 *$$

$$2.44 \leq \psi_4 \leq 2.40 \text{ N.S.}$$

$$0.48 \leq \psi_5 \leq 4.16 \text{ N.S.}$$

$$2.06 \leq \psi_6 \leq 2.98 \text{ N.S.}$$

^a

- ψ_1 : Contrast of small with large sized school board means.
- ψ_2 : Contrast of small with average sized school board means.
- ψ_3 : Contrast of small and large sized, low complexity with small and large sized, high complexity school board means.
- ψ_4 : Contrast of small and average sized, medium complexity with small and average sized, high complexity school board means.
- ψ_5 : Contrast of small and large sized, medium complexity with small and large sized, high complexity school board means.
- ψ_6 : Contrast of average and large sized, medium complexity with average and large sized, high complexity school board means.

* Significant at the .05 level.

Table XII
Overall Hypotheses Tests for Ratio II

Sources of Variation	Number of Degrees of Freedom	Sum of Squares	Mean Square	F-value
C	2	8.22	4.11	2.32 N.S.
S	2	112.35	56.18	31.73 *
SC	4	13.84	3.46	1.95 N.S.
error	30	53.12	1.77	

Scheffé post hoc test.^a

95% confidence intervals for S:

$$3.06 \leq \psi_1 \leq 6.01 *$$

$$1.10 \leq \psi_2 \leq 3.74 *$$

^a

ψ_1 : Contrast of small with large sized school board means.

ψ_2 : Contrast of small with average sized school board means.

* Significant at the 0.05 level.

Table XIII
Overall Hypotheses Tests* for Ratio III

Sources of Variation	Number of Degrees of Freedom	Sum of Squares	Mean Square	F-value	
C	2	6.11	3.06	0.19	N.S.
S	2	72.07	36.04	2.19	N.S.
SC	4	71.95	17.99	1.09	N.S.
error	32	493.78	16.46		

* None of the effects is significant at the 0.05 level.

size designations of small and average. There were no significant differences for the mean of administrative Ratio III between any two school board size designations.

2. The difference between mean administrative ratios of small sized, low complexity and large sized, low complexity school boards was significantly different than that between small sized, high complexity and large sized, high complexity school boards. In effect there was significant interaction between the two variables, organizational size and complexity.

These results will be discussed and interpreted in the light of their theoretical significance in the following chapter.

CHAPTER IV

DISCUSSION OF THE RESULTS

The purpose of this study was twofold: to determine 1) whether the means of administrative ratios of small sized school boards were larger than those of either average or large sized school boards, and 2) whether the differences of mean administrative ratios between small and large sized low complexity school boards were different than those of small and large sized high complexity school boards.

This purpose was intended to provide a test of the formal theory of differentiation of Blau¹. This theory held that the expanding size of organizations gives rise to increasing subdivision of responsibilities, facilitates supervision, widens the span of control, and simultaneously creates structural differentiation and problems of communication and coordination that require managerial and supervisory attention². Thus, from the standpoint of the theory, large size has opposite effects on administrative components. Expanding organizational size reduces the

1 Peter M. Blau, "Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 201-218.

2 Ibid., p. 201.

administrative component because of an "economy of scale in supervision"³, and raises it indirectly through the "feedback effects of inter-unit heterogeneity that differentiation creates"⁴.

The sample, instrument, procedures for obtaining data and the statistical analyses of the data were described in the preceding chapters. The results of the analyses are now discussed with reference to the theory which was being tested. This discussion is presented in the following sections.

1. Discussion of the Results of Testing the First Hypothesis.

This hypothesis, stated in the direction consistent with the theory, was that the means of administrative ratios of small sized school boards are larger than those of either average or large sized school boards.

The pre-experimental reasoning was that increasing organizational size creates structural differentiation. The structural differentiation results in an economy of scale in supervision for most personnel components. Further, the negative feedback processes caused by the inter-unit

3 Ibid., p. 210.

4 Ibid., p. 214.

heterogeneity of more highly differentiated structures appear to keep the amount of differentiation produced by increasing organizational size below the level at which the additional administrative costs of coordination would equal the administrative savings realized by the larger scale of operations. Consequently, organizations should exhibit an economy of scale in administration.

Additionally, this economy of scale in administration, according to the theory, "itself declines with increasing organizational size"⁵ due to the extra overhead caused by the negative feedback processes associated with higher degrees of inter-unit heterogeneity accompanying large scaled operations.

Consequently, it followed that school boards should exhibit the theoretical "economy of scale in administration"⁶. Thus, the means of administrative ratios of small sized school boards should be larger than those of larger sized school boards.

The test of the hypothesis revealed that administrative ratio I (proportion of top administrators) and administrative ratio II (proportion of top administrators plus the intermediate personnel component) means are significantly

5 Ibid., p. 217.

6 Ibid.

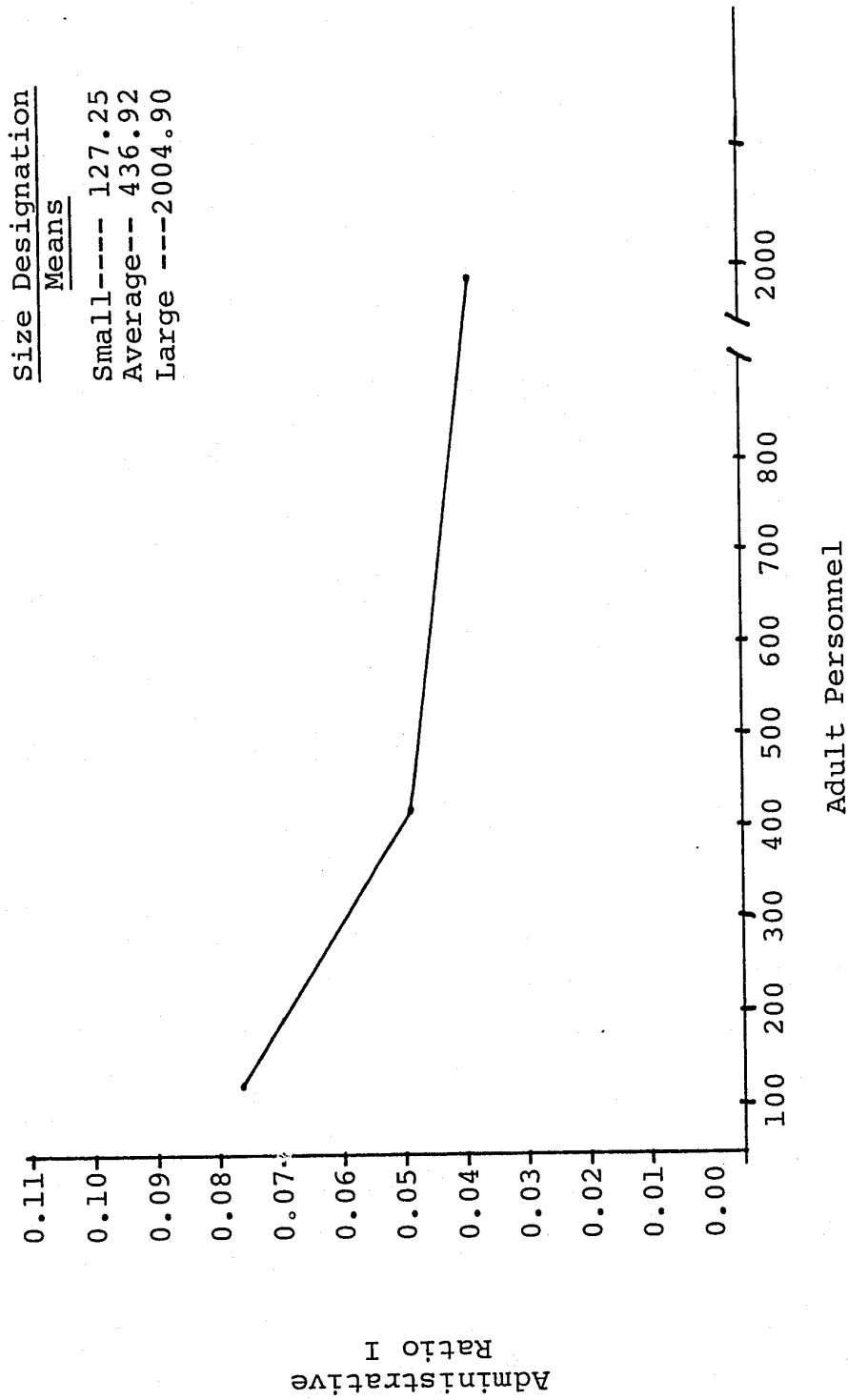
greater in small sized school boards than those of either average or large sized school boards. The examination of the data for administrative ratio III (proportion of top administrators, intermediate and supervisory personnel components) did not reveal any significant differences between the school board size designations as was hypothesized.

The graphs 1 - 3 present the three administrative ratios plotted against total personnel, the index of school board size adopted for purposes of this study.

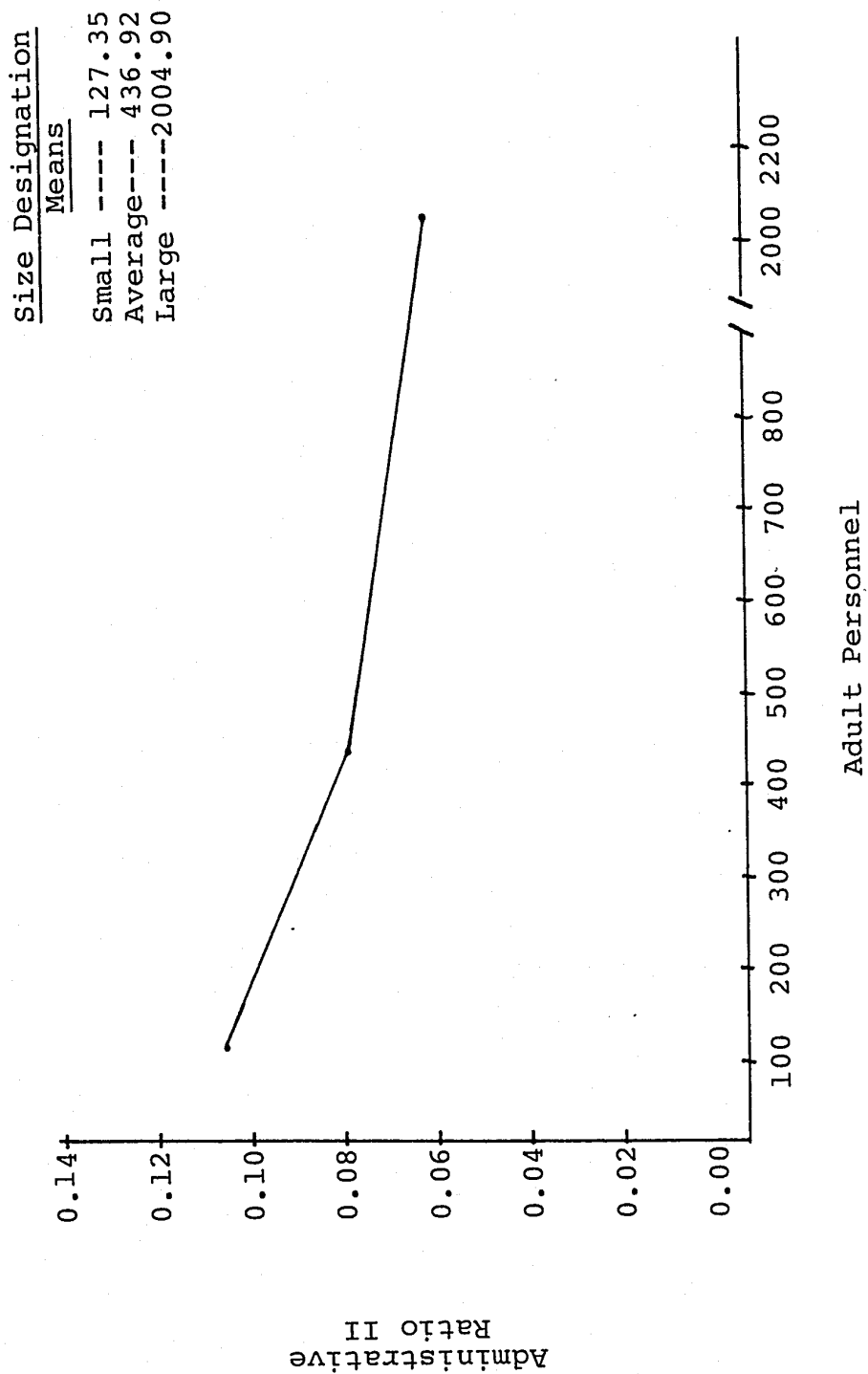
The graphs 1 - 3 reveal that all administrative ratios appear to exhibit patterns which tend to reflect Blau's theoretical "decline in the economy of scale"⁷. In essence, the graphs tend to suggest that all ratios exhibit declining rates of decrease in the economies of scale with increasing organizational size. This is reflected on all three graphs, 1 - 3, by curves in the negative slopes of the lines of the ratios on size that show that the ratios of administrative overhead drop first sharply from small to average sized school boards, and then more gradually with increasing organizational size, from average to large sized school boards.

The graph for each of the administrative ratios presents a directional tendency of an inverse relationship

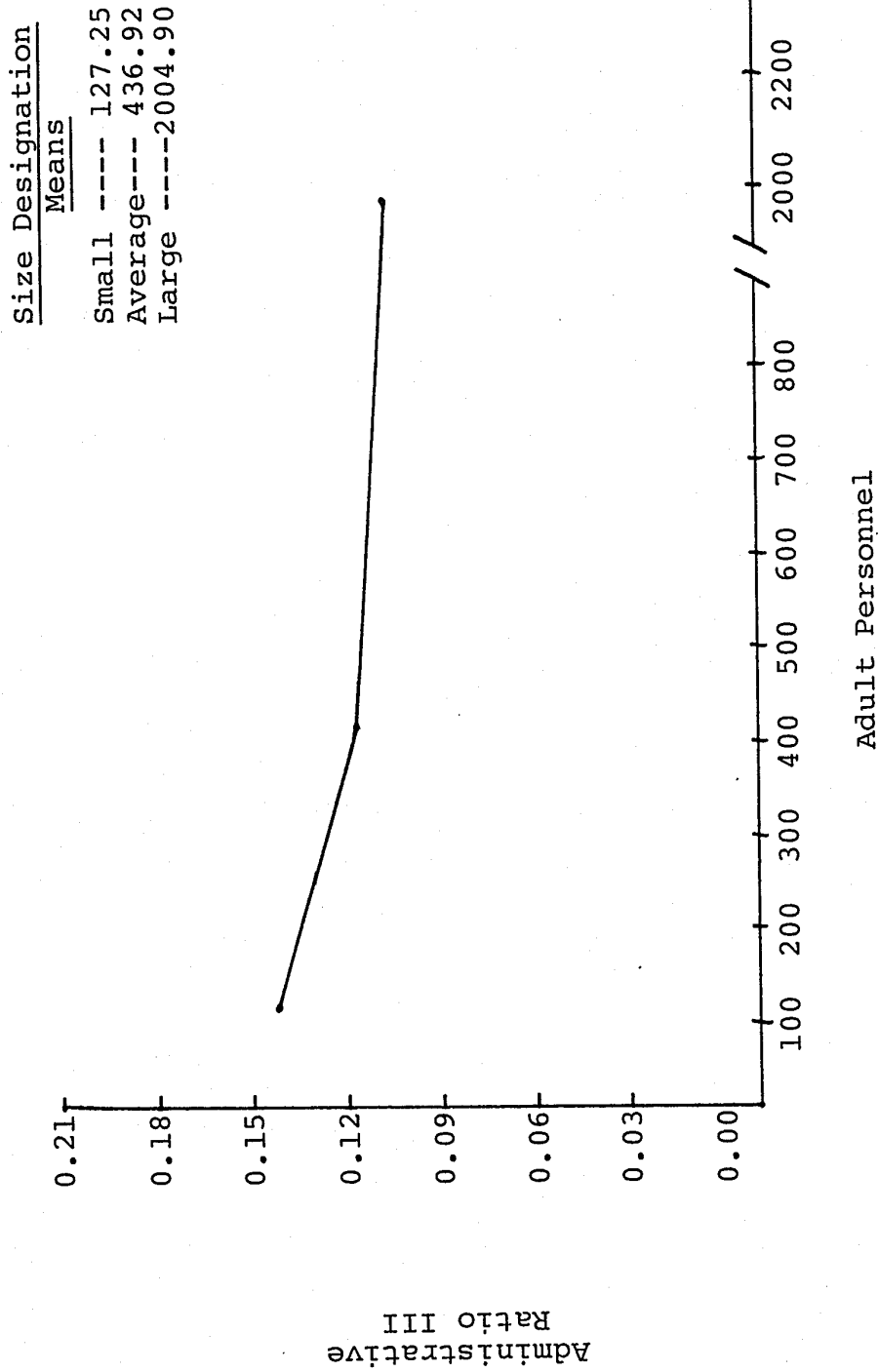
7 Ibid., p. 215.



Graph 1. Administrative Ratio I Plotted Against Total Personnel - An Indicator of Organizational Size



Graph 2. Administrative Ratio II Plotted Against Total Personnel - An Indicator of Organizational Size



Graph 3. Administrative Ratio III Plotted Against Total Personnel - An Indicator of Organizational Size

between the variables, administrative ratios and organizational size.

The above notwithstanding, the data revealed wide variations in the degree to which the three measures of the criterion variable, administrative ratios, reflected different economies of scale from one school board size designation to another. Consequently, a discussion of the variances in the economies of scale of the three different definitions of the administrative component is deemed necessary. This discussion will be presented next in three sections: 1) Ratio I, 2) Ratio II, and 3) Ratio III.

1. Ratio I — (Proportion of top administrators). The Scheffé post hoc examination of the data for significant size main effects revealed that ratio I means were significantly different between small and average, small and large sized school boards. The difference of 4.64-3.76 of ratio I means from average to large sized school boards strongly suggests a nonsignificant difference.

The significant decrease in the mean of administrative ratio I from small to average sized school boards and the apparent nonsignificant difference of 0.88 between the means of administrative ratio I from average to large sized school boards offer support for Blau's proposition that the "economy of scale in administration itself declines"⁸.

8 Ibid., p. 217.

Statistical analysis for determining whether there was a linear or curvilinear relationship between the variables, administrative components and organizational size, was not utilized. However, the pattern of significant and non-significant differences of mean administrative ratio I from small to average to large sized school boards does permit us to draw the inference that the negative relationship is indeed curvilinear.

The discussion of the economies of scale of administrative ratio II is presented next.

2. Ratio II — Proportion of top administrators plus intermediate personnel component). The Scheffé post hoc examination of size main effects revealed that the means of administrative ratio II are significantly different between small and large sized school boards and also between small and average sized school boards. The difference of 2.09 for ratio II as compared with the difference of 0.88 for ratio I means between average and large sized school boards suggest that the overall economy of scale in administration for ratio II is different than that for administrative ratio I. The exact location of differences in the economies of scale of both ratios I and II appear to lie between average and large sized school boards. Hence, one can state that when the administrative ratio is defined as the proportion of top administrators plus intermediate personnel, the economy of scale in administration does not exhibit as great a decline in its rate of decrease.

The economy of scale for administrative ratio III is presented next.

3. Ratio III — (Proportion of top administrators, plus intermediate and supervisory personnel). The analysis of variance testing of the size main effects revealed that there are no significant differences for the means of administrative ratio III between any two size designations of school boards. Consequently, when the administrative ratio is so defined as to include supervisory personnel acting in a supportive role, a significant economy of scale in administration is not evidenced through an examination of the data.

The results show that all sizes of school boards tend to have approximately the same proportion of top administrators, intermediate and supervisory personnel. Given the fact that both the top administrators and intermediate personnel exhibit economies of scale from small to large sized school boards, one must conclude that the proportion of supervisory personnel must show a positive relationship with increasing organizational size to counteract the economy of scale in the top administrative and intermediate personnel components. The trend of increase or decrease in the proportion of supervisory personnel from small to large sized school boards is obtained by simply subtracting the numerical value of ratio II from ratio III.

Completion of this subtraction operation provides us with the following statistics: Small (ratio III-ratio II) is 3.53; Average (ratio III-ratio II) is 4.09, and Large (ratio III-ratio II) is 4.90.

Consequently, there is empirical support for the existence of a positive relationship between the proportion of supervisory personnel and increasing organizational size.

In summary, the test of the hypothesis demonstrated that increasing organizational size is negatively related to decreasing administrative ratios for the two administrative ratios that were more restrictively defined.

Empirical support was found for Blau's proposition that the economy of scale in administration itself declines. However, the proposition when applied to school board personnel components was only supported by administrative ratio I, the most restrictive definition of the administrative component.

2. Discussion of the Results of Testing the Second Hypothesis.

In a direction consistent with the theory, the second hypothesis stated that there would be interaction between the variables, organizational size and complexity, as they affect variances in administrative component ratios. Specifically, the difference of mean administrative ratios between small and large sized, low complexity school boards

are different than those between small and large sized, high complexity school boards.

The pre-experimental reasoning was that the differentiation engendered by increasing organizational size indirectly raises the proportion of administrative to total personnel. Differentiation intensifies problems of coordination and communication and enlarges the requirements for administrative manpower.

The savings in administrative overhead that large scale operations make possible through the economies of scale in supervision are counteracted by the expansion in the administrative overhead required to meet the added responsibilities of coordination and communication.

Consequently, the direct effects of large organizational size of lowering the administrative component and the indirect effects of large size, by fostering differentiation increases administrative overhead, are in opposite directions.

Subsequently, the economy of scale in low complexity organizations should exhibit minimal rates of decline. However, the economy of scale in high complexity organizations should exhibit maximal rates of decline. Hence, mean administrative ratios of low complexity school boards should exhibit significant decreases while the administrative

component ratios of high complexity school boards should not reflect significant decreases.

The test of the hypothesis revealed that there are significant differences between the differences of mean administrative component ratio I of small and large sized, low complexity school boards and those of small and large sized, high complexity school boards. The hypothesis was not supported for ratios II and III.

The results of this analysis are consistent with the results obtained for the testing of hypothesis 1. For hypothesis 1 it was noted that only administrative ratio I reflected significant declines in its economy of scale. If complexity interacts with organizational size and causes the economy of scale in administration to decline, and if administrative ratio I exhibits this significant decline in its economy of scale, then one should only expect administrative ratio I to reflect the interactive effects of organizational size and complexity.

The results of the testing of the hypothesis applied individually to each of the three administrative ratios revealed wide differences in the extent to which there was significant interaction between the variables, organizational size and complexity, as they affected variations in the economy of scale in administration.

The following explanations are offered with respect to the findings of a nonsignificant interaction between the variables of organizational size and complexity for administrative ratios II and III.

1. The implication of the difference of the means of administrative ratio II from small to average (2.66) and from average to large (2.09) Ontario school boards as reflected in Table X is that the economy of scale exhibited by the intermediate personnel component is relatively constant. In addition, when one considers the fact that an examination of the data for administrative ratio III revealed that the proportion of supervisory personnel increased greatly with accompanying increases in school board size, a logical inference can be made. The intermediate personnel reflect larger spans of control. The factors that would tend to increase the intermediate span of control are related to the nature of large school board operations.

In large school board operations, the increased capacities which supervisory personnel bring to bear upon increasingly delimited areas of operations may enable them to deal more effectively with their subordinates and thus reduce the need for increased supervision or attention from the members of the intermediate component with increasing organizational size.

In addition, large school board systems may possibly employ subordinates who are more specialized in their functions and more capable of executing their responsibilities with less supervision than less specialized personnel. This would result in a constant rate of decline for the economy of scale of supervision for the intermediate component. Given the above possibilities, it is possible that the type of control exerted by administrative personnel in large systems differs from that exerted in smaller systems. This control may be reflected by the variance in the importance of informal and formal competencies of the intermediate personnel from small to large school board operations. Indeed, the professional capabilities of people occupying intermediate administrative posts may differ with the size of the system.

2. An alternative explanation for the increase in the proportion of supervisory component of school boards may relate to the youth of the Ontario school boards.

With a broadening of the educational functions and services; with public demands upon the Ontario school boards to offer more programs and with the added societal demands for more rapid program innovations, increases in specialist personnel probably have been viewed as essential, by Ontario school board members, to meet these demands. The examination of the data of this study suggests that if the

above circumstances are true for the Ontario school boards, then the disproportionate increase of specialist personnel characterizes the supervisory component.

If the societal demands placed upon the Ontario school boards have resulted in the subdivision of task responsibilities which necessitated high expertise, and the highly specialized supervisory personnel have effected the widening of the intermediate span of control, then one might logically say that differentiation of this mode may in turn stem further differentiation at the next highest authority level. Consequently, level of expertise indirectly controls the theoretical decline in the economy of scale in supervision and administration.

In summary, the data for administrative ratio I revealed support for the essence of the hypothesis that there is interaction between the variables, organizational size and complexity, as they effect variances in administrative component ratios.

In conclusion, the theory tested presents economies of scale in administration as being negatively related to increasing organizational size. In addition, the decline in the economies of scale in administration is related to the interaction of the variables, organizational size and complexity. The marginal influence of increasing organizational size upon differentiation decreases and

consequently highly complex boards of different size designations exhibit minimal differences in their administrative ratios.

The analysis of the data for administrative ratio I, the most restrictively defined measure of the criterion variable, suggests that both organizational size and organizational complexity are crucial factors in determining variances in the economies of scale in administration.

SUMMARY AND CONCLUSIONS

The purpose of this investigation was to test Blau's formal theory of differentiation as it applied to the over-all economies of scale in Ontario school board administrative components and the declines in these economies of scale.

The two predictor variables of the study were organizational size and organizational complexity. The criterion variable was administrative component. Organizational size was defined as the total number of adult personnel employed by a school board. Organizational complexity was defined as the degree of hierarchical and vertical differentiation, and spatial dispersion. Administrative component was variously defined as: 1) number of top administrators, 2) number of top administrators and intermediate personnel, and 3) number of top administrators, intermediate and supervisory personnel.

A test of the above involved two specific hypotheses which, stated in a form consistent with the theory, were as follows:

1. The mean administrative ratios of small sized school boards are larger than that of either average or large sized school boards.

2. The difference between mean administrative ratios of small sized, low complexity and large size, low

complexity school boards is different than that between small sized, high complexity and large sized, high complexity school boards.

The results of testing these two hypotheses are presented in Table XIV.

The conclusions based on perusal of Table XIV which represents the results of the testing of the hypotheses were as follows:

1. The mean administrative ratios of small sized school boards are significantly larger than that of either average or large sized school boards.

2. The difference between mean administrative ratios of small sized, low complexity and large sized, low complexity school boards are significantly different than that between small sized, high complexity and large sized, high complexity school boards.

These conclusions indicated that the specific hypotheses of this study were supported and that a modest amount of knowledge was added to the theories of organizations.

The theory tested suggests that the issue concerning the effects of organizational size and complexity is not so much the relative importance of each. Although in terms of the growth in supervisory personnel, the division of labor reflected by higher complexity seems to be more important.

Table XIV
Results of Testing of Hypotheses

Contrasts *	Sources of Variation	Administrative Ratios		
		R_1	R_2	R_3
Not hypothesized	(C) Complexity	X	X	X
	(S) Size			
$U_S - U_L$	$\psi 1$	V	V	X
$U_S - U_A$	$\psi 2$	V	V	X
	(SC) Interaction			
$(U_1 - U_7) - (U_3 - U_9)$	$\psi 3$	V	X	X
$(U_2 - U_5) - (U_3 - U_6)$	$\psi 4$	X	X	X
	$\psi 5$	X	X	X
Not hypothesized	$\psi 6$	X	X	X

* U_S : Estimated mean for small sized school boards.

U_A : Estimated mean for average sized school boards.

U_L : Estimated mean for large sized school boards.

U_1 : Estimated mean for small sized, low complexity school boards.

U_2 : Estimated mean for small sized, medium complexity school boards.

U_3 : Estimated mean for small sized, high complexity school boards.

U_5 : Estimated mean for average sized, medium complexity school boards.

U_6 : Estimated mean for average sized, high complexity school boards.

U_7 : Estimated mean for large sized, low complexity school boards.

U_9 : Estimated mean for large sized, high complexity school boards.

Rather, the fact that the effects of size and complexity are opposing and hence interactive.

A cross sectional study such as this one should have established relationships. Causes can be inferred from a theory, such as Blau's, that generates a dynamic model about changes over time. The contribution of this study has been to establish complexity as an operationally defined and empirically validated concept in the organizational size — organizational complexity — administrative component ratio relationship. This should enable future procedural and dynamic studies to be carried out on a much more rigorous and comparative basis than has been done previously.

This study suggests that the factors, organizational size and organizational complexity, are intricately connected, and thus the temporal sequence or causality implied by the theory is accepted as valid.

The analysis of the data obtained in this study verifies Blau's theoretical propositions and confirms original speculation that unidentified factors like organizational complexity might account for disparate findings regarding the relationship between size of the administrative component and organizational size. The non-significant increase in organizational complexity from small to average sized school boards suggests that those studies which assume a linear relationship between increasing organizational size

and organizational complexity, as a basis for investigating the relationship between size and administrative component ratios, would do well to question their assumption.

The empirical framework of this study was limited. Consequently, it is of the greatest importance that the conclusions be viewed cautiously. They are strictly speaking valid only within the specific conditions of this research; for example, the theoretical rationale, the particular sample, measuring instrument, and procedures utilized in obtaining the data.

These limitations suggest that some merit may lie in conducting replicative studies on organizations outside of the educational context.

It is recommended that replicative studies attempt to gain a further degree of specificity than can be obtained in the sole adoption of any existing organizational framework. The Aston methodology which contributed the general parameters within which the analytical tool, Blau's theory of differentiation, was operationalized, needs further investigation. The Aston approach, in and of itself, will not allow for the charting of changes in variables such as administrative component ratios as they are affected by contextual factors such as organizational size. However, the importance of utilizing organizational conceptualizations, such as the Aston framework, is inestimable since

it does reflect a concern for the multi-dimensionality of organizational structure and its inherent dynamics.

The particular findings of this study which suggest the importance of organizational complexity as a variable in organizational analysis does not necessarily negate alternative explanations for variances in economies of scale in administration.

It is conceivable that, though size might indeed be a major factor in determining a high degree of structural complexity, size may not necessarily be the sole determinant of such complexity. As Hall states it, "Various configurations of complexity come about because of factors other than size"¹.

Other areas of speculation which are in need of testing from a sound theoretical base are as follows:

1. Blau, Heydebrand and Stauffer's contention that the existence of "two-way communication channels"² has important implications for administrative ratios under norms of rationality.

1 Richard H. Hall, "Professionalization and Bureaucratization", American Sociological Review, Vol. XXXIII, February 1968, p. 92-104.

2 Peter M. Blau, Wolf V. Heydebrand and Robert E. Stauffer, "The Structure of Small Bureaucracies", American Sociological Review, Vol. XXXI, April 1966, p. 459.

2. Level of personnel expertness may offer further insights into the occurrence of complexity configurations. Blau maintains that "departments with personnel having expert qualifications were found, with narrower spans of control for those in the hierarchy"³. This relationship is reinforced by Meyer's findings that in divisions with high levels of expertness, there was a low span of control. Meyer further states that, "It is not expertness, in and of itself, but rather the need for frequent consultations and communications that produces low spans of control in parts of the organization with highly qualified personnel"⁴.

The findings of Meyer, Blau and others reinforce Hall's subtle distinction between the two modes of hierarchical differentiation: subdivision of task responsibilities which necessitates high expertise and subdivision to reduce the extent of expertise to adequately cope with the responsibilities⁵.

3 Peter M. Blau, "The Hierarchy of Authority in Organizations", American Journal of Sociology, Vol. LXXIII, January 1968, p. 453-468.

4 Marshall W. Meyer, "Expertness and the Span of Control", American Sociological Review, Vol. XXXIII, December 1968, p. 950.

5 Richard H. Hall, Organizations: Structure and Process, Englewood Cliffs, New Jersey, Prentice-Hall, Incorporated, 1972, p. 143.

Consequently, if horizontal differentiation is of the first mode, then differentiation may in turn promote further differentiation which is independent of the size factor.

A suggestion more general than those previously mentioned concerning future studies relates to the Aston conceptualization itself. The possibility exists that the existence of certain degrees of structural characteristics of organizations may in turn act as determinants for changes in yet other structural features. The testing of such a possibility must extend beyond the present scope and design of the conceptualization utilized in this study.

If future studies of organizations employ such conceptual frameworks as the Aston approach and analytical tools such as Blau's formal theory of differentiation, real advances will be made in organizational theory building.

BIBLIOGRAPHY

Anderson, Theodore R. and Seymour Warkov, "Organizational Size and Functional Complexity: A Study of Administration in Hospitals", American Sociological Review, Vol. 26, No. 1, February 1961, p. 23-28.

The authors reported on their investigation into the relationships of size, complexity, and the relative size of the administrative component in only one type of organization, namely army hospitals. The authors' study was one of the first to hypothesize that organizational complexity might be a relevant factor in determining variances in economies of scale in administration.

Bakke, Edward W., "Concept of the Social Organization", in Mason Haire (ed.), Modern Organization Theory, New York, John Wiley and Sons, Limited, 1959, p. 16-75.

The author defined a clearer, more comprehensive, and systematic picture of the nature and structure of the social organization than had been evidenced in the literature on social organizations. The author's description of the social organization, which utilized as a framework the Bonds of Organization, focused attention on activity as the basic stuff of organizations. The concept of the social organization that was developed was highly theoretical and complicated.

Blau, Peter M., "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, No. 2, April 1970, p. 201-127.

In this paper, the author developed a systematic theory of differentiation in organizations. The essence of the theory is that increasing organizational size generates differentiation and differentiation occurs along various dimensions at decelerating rates and enlarges the administrative component in organizations to effect coordination. The theory is confined to the analysis of the formal structure, specifically its differentiation, of organizations ignoring the informal relations and behavior of individuals within organizations.

Gill, Norman and David Friesen, "Administrative Staff and School System Size", Canadian Administrator, Vol. VIII, No. 1, October 1968, p. 1-4.

In this paper, the authors described their study of thirty-eight school systems in the four western Canadian provinces. Their focus of attention was placed upon the relationships between school system size and the threshold for the occurrence of various administrative offices, and the ratio between the size of the administrative staff and the size of the school system. The authors related their findings in school systems to non-educational organizations.

Hall, Richard H., Organizations: Structure and Process, Englewood Cliffs, New Jersey, Prentice-Hall, Incorporated, 1972.

This book treated organizations as organizations rather than dealing with the individuals of which they are comprised as the subject of discussion. The author's primary purpose was to analyze organizations in such a way that the analysis reflected two major concerns: 1) the impact of the organization upon the environment, and 2) the impact of the environment upon the organization. With this two-fold objective in mind, the book initially describes organizations as static entities and proceeds, in its latter chapters, to effectively discuss organizational change.

Chapters four and five dealt effectively with the conceptual and methodological issues that surround two major organizational variables, size and complexity.

Hass, Eugene, Richard H. Hall and Norman Johnson, "Organizational Size, Complexity and Formalization", American Sociological Review, Vol. XXXII, No. 6, December 1967, p. 903-912.

This article contained the authors' report of their investigation of seventy-five different organizations. The authors operationalized complexity as a multidimensional concept and presented an argument that complexity may not necessarily fit into a causal sequence following from size. Indeed, the authors suggested that researchers would do well to question the general assumption that organizations are necessarily highly complex. The specific contribution of this study was the operationalization of three major components for the complexity concept.

Holdaway, Edward A., "Staffing Metropolitan School Districts", Canadian Administrator, Vol. X, No. 7, April 1971, p. 29-35.

The author reported his investigation into the staffing patterns of seven major western Canadian metropolitan areas. An important contribution of this study was its classification of district personnel developed as a means of obtaining descriptive data concerning staffing and salary ratio to examine the relationship between these ratios and the size of the school system.

-----, and Thomas A. Blowers, "Administrative Ratios and Organizational Size: A Longitudinal Study", American Sociological Review, Vol. XXXVI, No. 1, April 1971, p. 278-286.

A research report on Blowers' Master's thesis completed in 1969. The authors presented 41 graphs of changes in administrative ratios for 41 urban school systems in Alberta over a five-year period. None of the graphs reflected any consistent tendency to rise or fall over the period of investigation.

-----, and Keith A. Vithayathil, "Administrative Ratios in School Systems", Canadian Administrator, Vol. IX, No. 4, January 1970, p. 15-19.

Contained a report of Vithayathil's Master's thesis completed in 1969. The study identified threshold sizes for the occurrence of various administrative offices in the Alberta school systems. The contribution of the study was seen in its methodology; specifically, the approach to utilizing multiple definitions of the administrative component which had not been previously employed in related research.

Pugh, D. S. et al., "A Conceptual Scheme for Organizational Analysis", Administrative Science Quarterly, Vol. VIII, No. 3, September 1963, p. 289-315.

This paper represented the Aston group's attempt to generalize and develop the study of work organizations and behavior into the consideration of three conceptually distinct levels of analysis of behavior in organizations: 1) organizational structure and functioning, 2) group composition and interaction, and 3) individual personality and behavior. This approach represented the initial development of an organizational framework as an alternative to the traditional Weberian approach to the analysis of organizations as bureaucratic types.

Pugh, D. S. et al., "Dimensions of Organization Structure", Administrative Science Quarterly, Vol. XIII, No. 1, June 1968, p. 65-105.

In this paper, the Aston group reported on their identification, definitions, and operationalization of five primary dimensions of organizational structure. The dimensions of 1) specialization, 2) standardization, 3) formalization, 4) centralization, and 5) configuration and their subsequent developed scales of measurement represented the basis for the development of a taxonomy of organizational structure.

-----, "The Context of Organization Structure", Administrative Science Quarterly, Vol. XIV, No. 1, March 1969, p. 91-114.

The authors presented seven primary concepts of organizational context: 1) origin and history, 2) ownership and control, 3) size, 4) charter, 5) technology, 6) location, and 7) dependence. These seven contextual variables were used to predict three underlying dimensions of organizational structure previously established. The contextual factors completed the development of the Aston framework which presents a means of conducting an investigation into organizations at the first level of analysis in their total organizational conceptualization outlined in their earlier article. A particular contribution of this article lay in the list of contextual factors that must be controlled experimentally or statistically during an investigation of one or several of their structural variables.

Rushing, William A., "The effects of Industry Size and Division of Labor on Administration", Administrative Science Quarterly, Vol. XII, No. 3, December 1965, p. 273-295.

Contains a report of the author's investigation of the effect of size and complexity upon administration in 41 industries. The report concluded with partial corroboration of Anderson and Warkov's hypothesis that reflected a concern for the importance of including complexity as a relevant variable in the organizational size-administrative ratio relationship. The author further concluded that his results demonstrated that the effects of size and division of labor (complexity) are independent, opposing and interactive.

Terrien, Frederick W. and Donald L. Mills, "The Effect of Changing Size Upon the Internal Structure of Organizations", American Sociological Review, Vol. XX, No. 1, February 1955, p. 11-13.

A research report upon the investigation into the effects of increasing organizational size on internal structures. Specifically, the authors' thesis was that if the number of potential intra-group relationships increases at a faster rate than does the size of the group, then it would seem logical to suppose that those relationships would require at least a moderately increasing amount of supervision that would be reflected in an increasing proportion of administrative personnel. Their research indicated that organizational size and relative number of administrative personnel are positively related.

Appendix

Holdaway, Edward A., John F. Newberry, David J. Hickson and R. Peter Heron, "Dimensions of Organizations in Complex Societies: The Educational Sector", Administrative Science Quarterly, Vol. 20, March 1975, 20:37-55.

Using a modified version of the Inkson short form of the Aston questionnaire, this study examined contextual and structural variables of 23 community, private, and agricultural colleges and technological institutes in Alberta and British Columbia. The Aston methodology was shown to have discriminating power and structural differences were apparent in the four groups.

APPENDIX 1

DEFINITIONAL COMPARISON TABLES

Table XV

Comparison of Definitions for the
Organizational Size Variable

Author(s)	Organizational Type	General Definitions of Organizational Size
1. Anderson and Warkov	Veteran's Hospitals	Average Daily Patient Load (correlated .977 with total number of employees)
2. Blowers	School Systems	(a) Number of schools (b) Pupil Membership (c) Total Professional and Administrative Personnel Employed
3. Gill and Friesen	School Systems	Total Professional and Administrative Staff
4. Hass, Hall and Johnson	30 Different Types	Number of Employees
5. Hawley, Boland and Boland	Higher Education	Total Number of Faculty (correlated .943 with number of students)
6. Holdaway and Vithayathil	School Systems	(a) Number of Employees (b) Number of Teachers (c) Pupil Membership (d) Number of Schools
7. Patt and Tossi	Army Hospitals	Total Number of Employees
8. Rushing	41 Different Industries	Number of Production Personnel
9. Terrien and Mills	School Systems	Number of Employees

Table XVI

Comparison of Definitions for the
Administrative Component

Author(s)	Organizational Type	General Definitions of Administrative Component
1. Anderson and Warkov	Veteran's Hospitals	". . . the relative size of the administrative component was measured by the percent of all employees classified in the category 'General Hospital Administration'. This component includes the Manager's Office, the Registrar's Office and the Fiscal, Personnel and Supply Units".
2. Blowers	School Systems	"(a) all certified personnel including principals employed as members of school staffs, (b) all personnel identified as administrative staff and employed directly in or out of the central office of the school system, (c) all personnel who were employed in or out of central office in professional tasks but who were not categorized as administrative staff. Personnel listed on staffing returns who would not be categorized as teachers, professional employees of administrative staff were excluded. That is, non-professional clerical, cafeteria, transport, stores, equipment and maintenance staffs were excluded".

Table XVI
(Continued)

Author(s)	Organizational Type	General Definitions of Administrative Component
3. Gill and Friesen	School Systems	"The administrative staff . . . included: (a) principals; (b) personnel identified both as administrative and non-administrative staff, but employed or housed directly in the central office of the school system. It included pupil personnel workers, for example. Clerical, custodial, and cafeterial staffs and staffs of such sections as stores, equipment or maintenance were excluded".
4. Hass, Hall and Johnson	30 Different Types	". . . these persons engaged in activities which contribute indirectly to the attainment of organizational goals".
5. Hawley, Boland and Boland	Higher Education	". . . the number of full-time administrators, excluding department chairmen and heads of research institutes and bureaus".

Table XVI
(Continued)

Author(s)	Organizational Type	General Definitions of Administrative Component
6. Holdaway and Vithayathil	School Systems	"Previous studies have usually defined 'administrative component' in only one way. In the present study, six definitions were employed, none of which included department heads or similar offices as administrative personnel. The six definitions: 1. Central office administrative staff (this includes administrative staff employed at or working from the central office). 2. Central office administrative staff and principals. 3. Central office administrative staff, principals and vice-principals. 4. Central office administrative and professional staff (this includes central office employees who worked directly with teachers or pupils, for example, consultants and psychologists). 5. Central office administrative and professional staff and principals. 6. Central office administrative and professional staff, principals and vice-principals".

Table XVI
(Continued)

Author(s)	Organizational Type	General Definitions of Administrative Component
7. Patt and Tossi	Army Hospitals	"Administrative personnel are the full-time personnel equivalents . . . as the personnel required for medical center, hospital and dispensary administration. This includes the office of the facility commander, the facility comptroller, or management office, accounting and data processing services, personnel administration, medical records and reports, nursing administration, staff of the medical library, and other hospital administration services. The definition is based on the primary duties of the individual rather than his authority or responsibility".
8. Rushing	41 Different Industries	"Administrative personnel involve three categories: (a) managers, officials, and proprietors, (b) professional personnel, and (c) clerical personnel".
9. Terrien and Mills	School Systems	"The administrative components of the school district included the superintendent, his assistants and immediate staff, principals, business managers and the like. Persons in the non-administrative component were teachers, nurses, cafeteria workers and the like".

APPENDIX 2

INDICATORS OF COMPLEXITY

Hass, Hall and Johnson's Indicators of Complexity*

A. Division of Labor - General

1. The number of distinct organizational goals-multiple goals indicating a necessary division of labor beyond that required by a single goal.
2. Presence of more than one major organizational activity.

B. Division of Labor - Specific

1. The number of major divisions or departments (horizontal differentiation).
2. The most specialized department (number of distinct subdivisions under major departmental headings).
3. Mean intradepartmental subdivision (the total number of subdivisions divided by the number of departments).

C. Hierarchical Differentiation

1. Number of levels in the deepest single division.
2. The mean number of hierarchical levels for the organization as a whole (the sum of the number of hierarchical levels within every department divided by the number of departments).

D. Spatial Dispersion

1. The degree to which physical facilities are dispersed.
2. The location (distance from the organizational headquarters) of spatially dispersed facilities.
3. The degree to which personnel are spatially dispersed.
4. The location of spatially dispersed personnel.

* Quoted from the author's article, "Organizational Size, Complexity, and Formalization", American Sociological Review, Vol. XXXII, No. 5, December 1967, p. 906.

APPENDIX 3

FORMAL THEORY OF DIFFERENTIATION
CHART OF CONNECTIONS

Blau's Formal Theory of Differentiation in Organizations

1. Increasing size generates structural differentiation in organizations along various dimensions at decelerating rates.
 - (1A) Large size promotes structural differentiation.
 - (1B) Large size promotes differentiation along several different lines.
 - (1C) The rate of differentiation declines with expanding size.
 - (1.1) As the size of organizations increases its marginal influence on differentiation decreases.
 - (1.2) The larger the organization, the larger the average size of its structural components of all kinds.
 - (1.3) The proportionate size of the average structural component, as distinguished from its absolute size decreases with increases in organizational size.
 - (1.4) The larger the organization, the wider the supervisory span of control.
 - (1.5) Organizations exhibit an economy of scale in management.
 - (1.6) The economy of scale in administrative overhead itself declines with increasing organizational size.
2. Structural differentiation in organizations enlarges the administrative component.
 - (2.1) Large size of an organization raises the ratio of administrative personnel through the structural differentiation it generates.
 - (2.2) The direct effects of large organizational size (lowering the administrative ratio) exceed its indirect effect (raising it owing to the structural differentiation it generates).
 - (2.3) Differentiation of large organizations into sub-units stems the decline in the economy of scale with increasing size.

Peter Blau, "A Formal Theory of Differentiation in Organizations", American Sociological Review, Vol. XXXV, April 1970, p. 201-218.

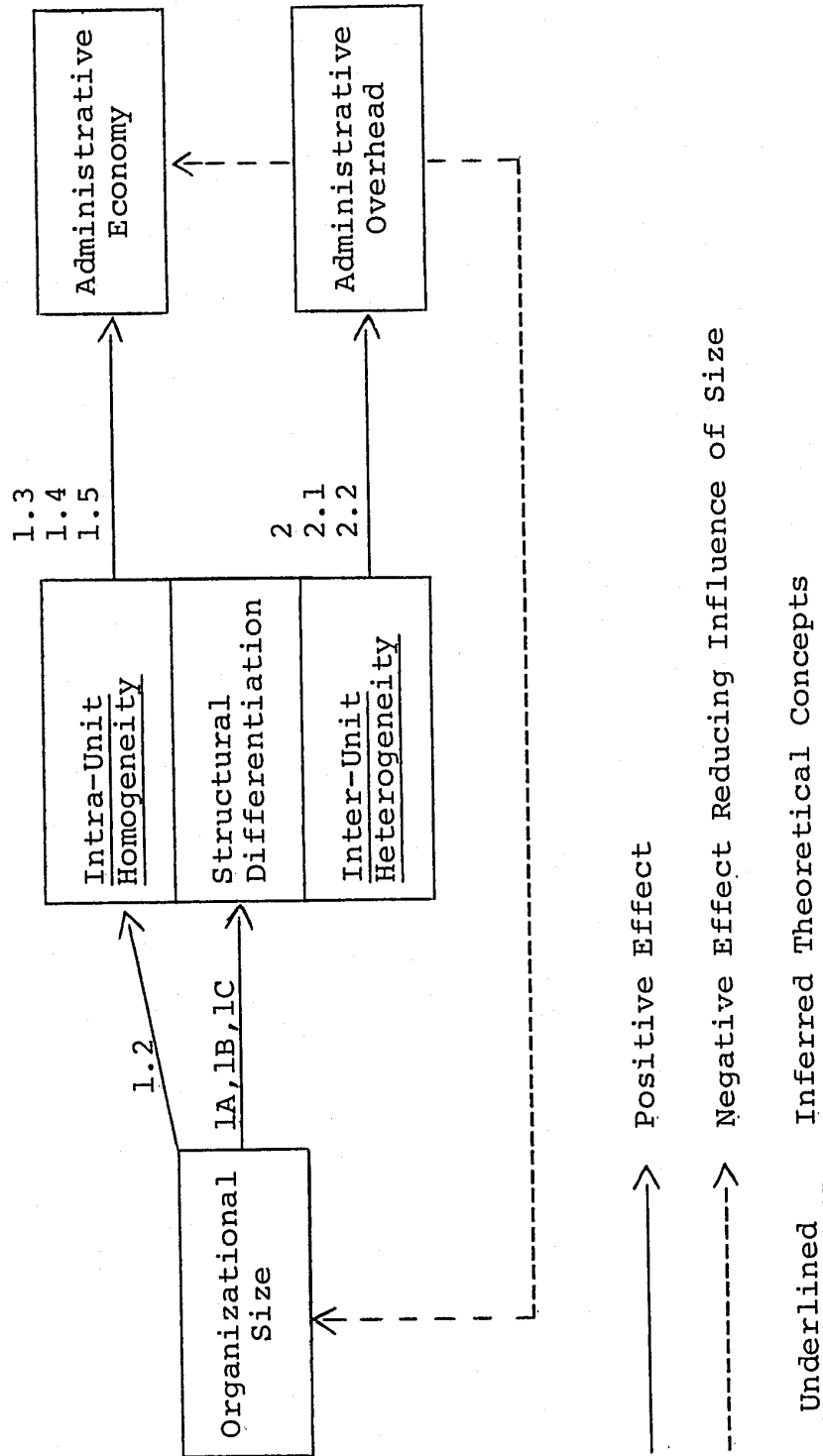


Figure 1 - Chart of Connections

APPENDIX 4
CORRESPONDENCE

A.

COVER LETTER

1701 Kilborn Avenue
Apt. 903, Playfair Towers I
Ottawa, Ontario
K1H 6M5
August 10, 1976.

Sir:

Under the supervision of Dr. Robert O'Reilly and Dr. Ian Dow and with the approval of the Department of Educational Administration, Faculty of Education, Ottawa University, I am undertaking a Doctor's Dissertation which solicits your cooperation.

The purpose of this doctoral research is to ascertain the effects that organizational size and structural complexity have upon various definitions of administrative components within the structures of the Ontario Boards of Education and the Combined County and District Roman Catholic Separate School Boards' headquarters.

The assistance that I would appreciate receiving from you is the completion of the enclosed questionnaire either by you, your research department or designate and the return of the same in the enclosed self-addressed, stamped envelope. I would also appreciate receiving a copy of your organizational chart if one is available.

Though the name of your school board is required for purposes of identification for my tabulation of questionnaire returns, you may be assured that the information which is provided by you or your officials will not be specifically identified with any information presented in the study.

I most certainly realize the tremendous premium placed on your time and that of your colleagues, but I will reciprocate by making the results of the study available to you either in abstract form or in tabled summary form, hoping that the results will allow you to assess the implications of your board's structure relative to other types of structural complexity configurations.

The return of the questionnaire as promptly as the demands of your office will permit would, indeed, be greatly appreciated. This will allow the data to be collected before the commencement of the 1976-77 academic year, thus avoiding the increased annual rush on administrative duties associated with the reopening of schools, etc. It too will allow the results to be forwarded to you at an earlier date. Thank you in anticipation of your cooperation.

Best personal regards for a successful year.

Sincerely,

Maxwell Trask,
Graduate Student
Ottawa University

B.

FOLLOW-UP LETTER NUMBER 1

1701 Kilborn Avenue
Apt. 903, Playfair Towers I
Ottawa, Ontario
K1H 6M5
August 31, 1976.

Sir:

During the past three weeks I have been soliciting the cooperation of the directors of the Ontario Boards of Education and the Roman Catholic Separate School Boards in connection with my doctoral research on selected Ontario School Boards, entitled AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE COMPONENT OF ONTARIO SCHOOL BOARDS.

The initial questionnaire send-out resulted in only a small percentage (30%) return. The sample for the study includes 98 boards of both types, and it is of tantamount importance that a much higher percentage of returns be obtained.

If you and your officials have been too busy to complete the initial questionnaire that was mailed to your office, it is quite understandable when one realizes the unusual increase in your administrative duties associated with the beginning of another school year. Hopefully, you will find time in what is obviously a very busy schedule to complete the second copy of my questionnaire and to return it in the enclosed self-addressed, stamped envelope.

In the event that you have considerably completed and returned the first questionnaire, please accept my appreciation for your kind cooperation. The results of the study will be forwarded to you as soon as the data analysis has been completed and the results are in table form.

Sincerely,

Maxwell Trask,
Graduate Student
Ottawa University

C.

FOLLOW-UP LETTER NUMBER 2

1701 Kilborn Avenue
Apt. 903, Playfair Towers I
Ottawa, Ontario
K1H 6M5
September 10th, 1976.

Sir:

During the past month I have been soliciting the cooperation of the directors of the Ontario Boards of Education and the Roman Catholic Separate School Boards in connection with my doctoral research on selected Ontario School Boards, entitled AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES, ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE COMPONENT OF ONTARIO SCHOOL BOARDS.

The initial questionnaire send-out resulted in only a small percentage (30%) return. The first follow-up letter produced an additional (8%) return. It is imperative that I obtain more returns if my research is to be completed.

If you have completed your copy of my questionnaire, please accept my appreciation for your kind cooperation. If circumstances have prevented you from doing so, I would like to encourage you to take a few minutes to do so since your completed questionnaire is so crucial to the fulfillment of this research.

Thank you for your cooperation in making this research possible.

Sincerely,

Maxwell Trask,
Graduate Student
Ottawa University

D.

FOLLOW-UP LETTER NUMBER 3

1701 Kilborn Avenue
Apt. 903, Playfair Towers I
Ottawa, Ontario
K1H 6M5
September 20th, 1976.

Sir:

During the past month and a half I have been soliciting the cooperation of the directors of the Ontario Boards of Education and the Roman Catholic Separate School Boards in connection with my doctoral research on selected Ontario School Boards, entitled AN EXAMINATION OF THE RELATIONSHIPS AMONG THE VARIABLES, ORGANIZATIONAL SIZE, COMPLEXITY, AND THE ADMINISTRATIVE COMPONENT OF ONTARIO SCHOOL BOARDS.

The initial questionnaire send-out resulted in only a small percentage (30%) return. The first follow-up letter produced an additional (8%) return. The second follow-up resulted in (5%) more returns.

If you have completed your copy of my questionnaire, please accept my appreciation for your kind cooperation. If circumstances have prevented you from doing so, I would like to encourage you to take a few minutes from what is obviously a very busy schedule to do so since the fulfillment of this research depends upon the receipt of your questionnaire.

Thank you for making this research possible.

Sincerely,

Maxwell Trask,
Graduate Student
Ottawa University

APPENDIX 5
QUESTIONNAIRE

An Examination of the Relationships Among the Variables,
Organizational Size, Complexity, and the Administrative
Component in Ontario School Boards

QUESTIONNAIRE

IDENTIFICATION

Directions: Fill in or check the appropriate blank.

1. Name of school board _____.
2. Name of educational region in which board is located:
NW _____ MN _____ NE _____ WE _____ NW _____
NG _____ CE _____ EA _____ OV _____
3. Type of school board:
County B.O.E. _____ Combined County R.C.S.S.B. _____
District B.O.E. _____ Combined District R.C.S.S.B. _____
City B.O.E. _____ City R.C.S.S.B. _____
4. Administrative head of board:
Director _____ Superintendent _____
5. Person furnishing data:
Name _____ Position _____
Phone No. _____
6. The total operating and capital budget of school board for
1975-76 \$ _____.
7. The percent of budget for administration: _____ %
(Administration defined as directors, asst. directors,
supt.'s and principals)
8. Type of organizational structure of board:
_____ Pure Area: Principals report directly to area
superintendents.
_____ Tiered: Area supt.'s report to functional
superintendents.
_____ Combinational: Principals report directly to supt.'s
who have both area and functional
responsibilities.
_____ Functional: Principals report directly to func-
tional supt.'s. No area supt.'s.
9. Date of consolidation of board _____.

QUESTIONNAIRE - PART I

ORGANIZATIONAL SIZE

Directions: Fill in or check the appropriate blank.

1. What was/is the exact number of students under your board's jurisdiction for the following selected years?

1972-73	_____	1974-75	_____
1973-74	_____	1975-76	_____

2. What was/is the exact number of teachers employed by your board for the following selected years?

1972-73	_____	1974-75	_____
1973-74	_____	1975-76	_____

3. What was/is the exact number of schools operated by your board for the following selected years?

1972-73	_____	1974-75	_____
1973-74	_____	1975-76	_____

NOTE: The following questions of the questionnaire seek information for the 1975-76 budget year.

4. What is the exact number of teachers employed by your board?

	<u>Full-time</u>	<u>Part-time</u>
Elementary	_____	_____
Secondary	_____	_____

5. Number of teacher aides working under your board _____.
 Number of hours (average) worked by aides _____.
 Number of aides receiving remuneration _____.

6. Type of transportation utilized by your board:

_____ All busing arrangements contracted out.
 _____ Busing handled entirely by board employees.
 _____ Combination of the above two items.

7. What is the total number of adult personnel employed by your board? _____

QUESTIONNAIRE - PART II

SCHOOL BOARD PERSONNEL

The following data is necessary for all classifications of board personnel since an administrative ratio will be determined in a variety of ways. Please indicate both the number of personnel in each occupational type within each category and give an indication of the area in which such personnel are located. NOTE: If your board employs personnel of occupational types other than those listed below, please add such personnel to the list.

Classification: Categories and Titles	Location			Number
	School	Board Office	Other	
<u>Administrative:</u>				
- Director	_____	_____	_____	_____
- Superintendent (s)	_____	_____	_____	_____
- Principal (s)	_____	_____	_____	_____
- Asst. or assoc. director (s) who full fill line functions	_____	_____	_____	_____
<u>Intermediate:</u>				
- Administrative Assistant (s)	_____	_____	_____	_____
- Assistant Superintendent (s)	_____	_____	_____	_____
- Vice-Principal (s)	_____	_____	_____	_____
- Business Administrator (s)	_____	_____	_____	_____
- Asst. Director (s): <u>exclude</u> <u>those listed in the above</u>	_____	_____	_____	_____
<u>Supervisory:</u>				
- Subject Consultant (s)	_____	_____	_____	_____
- Consultant (s)	_____	_____	_____	_____
- Dept. Head (s)	_____	_____	_____	_____
- Instructional Media Spec. (s)	_____	_____	_____	_____
- General Supervisor (s)	_____	_____	_____	_____

SCHOOL BOARD PERSONNEL

(Continued)

Classification: Categories and Titles	Location			Number
	School	Board Office	Other	
<u>Auxiliary:</u>				
- Psychologist (s)	_____	_____	_____	_____
- Psychomotrist (s)	_____	_____	_____	_____
- Speech/Hearing Spec. (s)	_____	_____	_____	_____
- Nurse (s)	_____	_____	_____	_____
- Counsellor (s)	_____	_____	_____	_____
- Attendance Officer (s)	_____	_____	_____	_____
<u>Clerical:</u>				
- Secretary (ies) (<u>rather than checking location, indicate number</u>)	_____	_____	_____	_____
- Typist (s)	_____	_____	_____	_____
- Accountant (s)	_____	_____	_____	_____
- Data Processor (s)	_____	_____	_____	_____
- Librarian (s)	_____	_____	_____	_____
- School Board Clerk (s)	_____	_____	_____	_____
- Receptionist (s)	_____	_____	_____	_____
- Clerk-typist (s)	_____	_____	_____	_____
<u>Service:</u>				
- Maintenance Worker (s)	_____	_____	_____	_____
- Custodial Worker (s)	_____	_____	_____	_____
- Transportation Worker (s)	_____	_____	_____	_____
- A.V. Technician (s)	_____	_____	_____	_____
<u>Other Occupational Types:</u>				
- _____	_____	_____	_____	_____
- _____	_____	_____	_____	_____
- _____	_____	_____	_____	_____
- _____	_____	_____	_____	_____
- _____	_____	_____	_____	_____

1. Are department heads expressed as full-time equivalents? YES _____ NO _____

QUESTIONNAIRE - PART III

COMPLEXITYSection A: Division of Labor - General.

Directions: Please check the following major organizational activities that are conducted within your school district. Indicate if these activities are conducted by all schools, a specialist school, classes within schools, or strictly at the school headquarters level.

Organizational Activity	All Schools	Classes Within Schools	Specialist School	School Board
1. General Education	_____	_____	_____	_____
2. Mentally Handicapped	_____	_____	_____	_____
3. Physically Handicapped	_____	_____	_____	_____
4. Emotionally Handicapped	_____	_____	_____	_____
5. Adult Education	_____	_____	_____	_____
6. Vocational Education	_____	_____	_____	_____
7. Kindergarten Program	_____	_____	_____	_____
8. Curriculum Development	_____	_____	_____	_____
- Others: (Please specify)				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Section B: Division of Labor - Specific.[illegible]

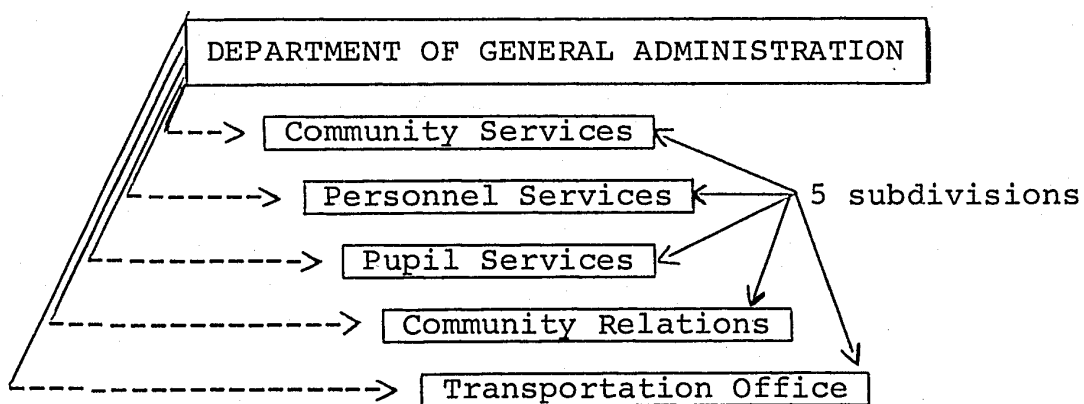
COMPLEXITY

(Continued)

Section B: Division of Labor - Specific.

Directions: Please complete the blanks.

1. Name of the department with the greatest number of subdivisions* is _____.
2. Number of distinct subdivisions in this department is _____.

* EXAMPLE OF SUBDIVISIONS:Section B: Division of Labor - Specific.

Directions: Please complete the blanks.

1. Total number of departments within school board is _____.
2. Total number of all subdivisions within all these departments of your school board is _____.

COMPLEXITY
(Continued)

Section C: Spatial Dispersion.

Directions: Please complete the blanks.

1. Total number of schools operated by your school board is _____.
2. Number of elementary schools is _____.
3. Number of secondary schools is _____.
4. Number of specialized schools is _____.

Section C: Spatial Dispersion.

Directions: Please complete the blanks.

1. Total number of adult personnel (Employees over 18 years of age) employed by your school board is _____.
2. Total number of personnel who work within the schools under the jurisdiction of your board is _____.
(Please exclude staff members who work from board headquarters.)

Section C: Spatial Dispersion.

Directions: Please complete the following question if you know the total number of miles between the school board headquarters and each school for all schools. If not, a form is included on which you may record your calculations.

1. Total number of miles between schools taken separately and the school board headquarters is _____ miles.

COMPLEXITY
(Continued)

2. Please approximate the distance (in miles) between each school operated by your board and the central headquarters of your board.

<u>School</u>	<u>Distance</u>	<u>School</u>	<u>Distance</u>	<u>School</u>	<u>Distance</u>
#1	_____	31	_____	61	_____
2	_____	32	_____	62	_____
3	_____	33	_____	63	_____
4	_____	34	_____	64	_____
5	_____	35	_____	65	_____
6	_____	36	_____	66	_____
7	_____	37	_____	67	_____
8	_____	38	_____	68	_____
9	_____	39	_____	69	_____
10	_____	40	_____	70	_____
11	_____	41	_____	71	_____
12	_____	42	_____	72	_____
13	_____	43	_____	73	_____
14	_____	44	_____	74	_____
15	_____	45	_____	75	_____
16	_____	46	_____	76	_____
17	_____	47	_____	77	_____
18	_____	48	_____	78	_____
19	_____	49	_____	79	_____
20	_____	50	_____	80	_____
21	_____	51	_____	81	_____
22	_____	52	_____	82	_____
23	_____	53	_____	83	_____
24	_____	54	_____	84	_____
25	_____	55	_____	85	_____
26	_____	56	_____	86	_____
27	_____	57	_____	87	_____
28	_____	58	_____	88	_____
29	_____	59	_____	89	_____
30	_____	60	_____	90	_____

COMPLEXITY

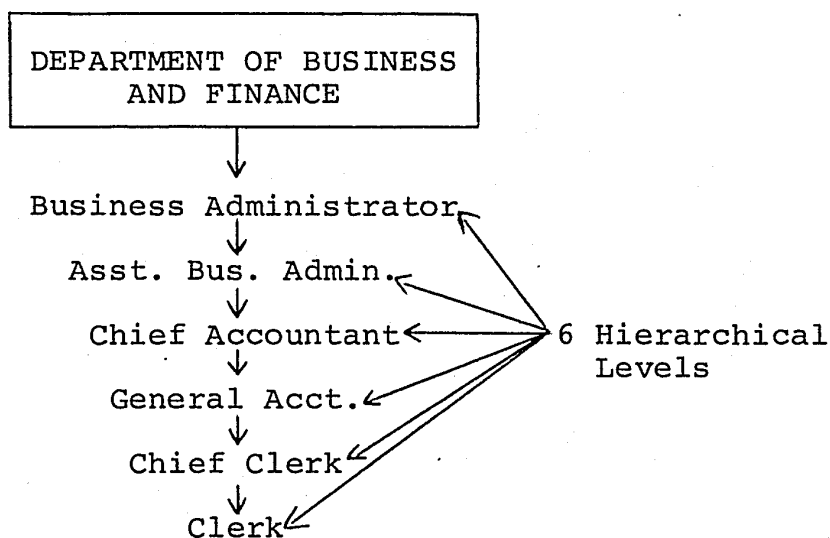
(Continued)

Section D: Hierarchical Differentiation.

Directions: Please complete the blanks.

1. Name of the department with the greatest number of hierarchical levels* (positions in line of authority within a department) is _____.
2. Number of hierarchical levels in this department is _____.

* EXAMPLE OF HIERARCHICAL LEVELS: A Business and Finance Department might possibly contain the following hierarchical levels.

Section D: Hierarchical Differentiation.

Directions: Please complete the blanks.

1. Total number of hierarchical levels in all departments of your school board is _____.
2. Total number of departments within your school board structure is _____.

APPENDIX 6

DISTRIBUTION OF SCHOOL BOARD TYPES
AND SIZE BY TOTAL ADULT PERSONNEL

Table XVII

School Board Type and Size by Total Adult Personnel

School Board Identification Number	School Board Type	School Board Size: Total Adult Personnel
1	Elementary	31.0
2	Elementary	48.0
3	Elementary	63.0
4	Combined	88.0
5	Elementary	134.0
6	Elementary	137.5
7	Elementary	148.0
8	Combined	152.0
9	Elementary	153.0
10	Combined	158.0
11	Combined	163.0
12	Elementary	186.0
13	Elementary	193.0
14	Elementary	214.8
15	Combined	242.0
16	Elementary	275.0
17	Combined	303.0
18	Combined	344.0
19	Elementary	369.0
20	Combined	386.0
21	Elementary	394.0
22	Combined	404.0
23	Combined	420.0
24	Combined	459.0
25	Combined	519.0
26	Combined	558.7
27	Combined	559.0
28	Elementary	700.0
29	Combined	844.0
30	Combined	1164.0
31	Combined	1208.0
32	Combined	1323.0
33	Combined	1335.0
34	Combined	1350.0
35	Combined	1590.0
36	Combined	2019.0
37	Combined	2671.0
38	Combined	2689.0
39	Combined	4000.0

APPENDIX 7

SCHOOL BOARD TYPE AND NUMBER OF EMPLOYEES IN
THE ADMINISTRATIVE COMPONENT BY DEFINITION

Table XVIII

School Board Type and Number of Employees in
the Administrative Component by Definition

School Board Identification Number	School Board Type	Administrative Component Definitions:		
		I	II	III
1	Elementary	3	4	4
2	Elementary	4	5	5
3	Elementary	6	8	9
4	Combined	6	9	18
5	Elementary	9	11	11
6	Elementary	10	15	22
7	Elementary	11	14	16
8	Combined	12	14	23
9	Elementary	10	14	16
10	Combined	14	18	21
11	Combined	11	13	35
12	Elementary	9	16	28
13	Elementary	19	22	23
14	Elementary	12	17	22
15	Combined	13	20	44
16	Elementary	13	22	27
17	Combined	14	25	47
18	Combined	17	26	37
19	Elementary	20	25	32
20	Combined	15	24	30
21	Elementary	19	29	36
22	Combined	21	40	41
23	Combined	15	27	30
24	Combined	13	23	66
25	Combined	26	55	76
26	Combined	27	42	72
27	Combined	28	44	72
28	Elementary	37	48	76
29	Combined	35	55	112
30	Combined	28	69	84
31	Combined	47	82	93
32	Combined	44	66	146
33	Combined	53	86	225
34	Combined	64	93	243
35	Combined	50	105	233
36	Combined	134	148	279
37	Combined	83	122	172
38	Combined	100	122	138
39	Combined	95	172	273

APPENDIX 8

RATIOS OF SIZE OF ADMINISTRATIVE COMPONENT TO EMPLOYEE
SIZE ACCORDING TO ADMINISTRATIVE COMPONENT DEFINITIONS

Table XIX

Ratios of Size of Administrative Component to Employee
Size According to Administrative Component Definitions

School Board Identification Number	School Board Type	Administrative Component Definitions:		
		I	II	III
1	Elementary	9.67	12.90	12.90
2	Elementary	8.33	10.42	10.42
3	Elementary	9.52	12.70	14.29
4	Combined	6.95	10.23	20.45
5	Elementary	5.97	8.21	8.21
6	Elementary	6.27	10.95	16.00
7	Elementary	7.08	9.46	10.81
8	Combined	7.57	9.21	15.13
9	Elementary	6.54	9.15	10.46
10	Combined	8.86	11.39	13.29
11	Combined	6.75	7.98	21.47
12	Elementary	5.58	8.60	15.05
13	Elementary	6.19	11.40	11.92
14	Elementary	5.61	7.91	10.24
15	Combined	5.37	8.26	18.18
16	Elementary	4.78	8.00	9.82
17	Combined	4.62	8.25	15.51
18	Combined	4.87	7.62	10.85
19	Elementary	5.37	6.72	8.60
20	Combined	3.89	6.22	7.77
21	Elementary	4.82	7.36	9.14
22	Combined	4.19	9.91	10.15
23	Combined	3.57	6.43	7.14
24	Combined	2.83	5.01	14.38
25	Combined	5.01	10.60	14.64
26	Combined	4.83	7.52	12.89
27	Combined	5.01	7.87	12.90
28	Elementary	5.29	6.86	10.86
29	Combined	4.15	6.52	13.27
30	Combined	4.12	5.93	7.23
31	Combined	3.09	6.79	7.70
32	Combined	3.33	4.99	11.04
33	Combined	3.97	6.44	16.85
34	Combined	4.74	6.89	18.00
35	Combined	5.13	5.44	13.94
36	Combined	3.11	6.60	14.65
37	Combined	3.72	3.79	4.17
38	Combined	3.71	3.11	5.32
39	Combined	2.38	4.55	6.82

APPENDIX 9

ANALYSIS OF VARIANCE TABLE AND
SCHEFFÉ POST HOC ANALYSIS

Table XX

Analysis of Variance Table for Ratios I, II and III
for Entire Sample of School Boards

Sources	Number of Degrees of Freedom	Sum of Squares	Mean Square	F-value
Among Ratios	2	8.81	4.40	49.35 *
Between Ratios	114	10.17	0.09	

* $p \leq .001$

Table XXI
Scheffé Post Hoc Analysis

Contrast of Ratio Means	Lower Limit	Upper Limit	Significant*
U1 - U2	- 4.18	- 0.82	Yes
U1 - U3	- 8.33	- 4.97	Yes
U2 - U3	- 5.83	- 2.48	Yes

* $p \leq .05$

APPENDIX 10

SCHOOL BOARD TYPE AND COMPLEXITY SCORES (T-SCORES)

Table XXII

School Board Type and Complexity Score (T-score)

School Board Identification Number	School Board Type	Part I: Division of Labor-General	Part II: Division of Labor-Specific	Part III: Spatial Dispersion	Part IV: Hierarchical Differentiation	Total Complexity Score
1	Elementary	42.2	33.4	30.8	32.9	145.1
2	Elementary	33.7	35.5	52.1	51.7	173.0
3	Elementary	42.2	37.2	38.7	32.9	151.0
4	Combined	33.7	39.2	47.1	41.9	195.6
5	Elementary	59.1	44.5	42.3	39.1	185.0
6	Elementary	50.7	45.7	43.4	56.2	196.0
7	Elementary	42.2	44.6	42.5	43.8	173.1
8	Combined	33.7	41.0	46.6	43.8	165.1
9	Elementary	50.7	45.7	46.1	42.3	184.8
10	Combined	42.2	41.0	49.6	43.8	176.6
11	Combined	50.7	40.7	50.5	43.8	185.7
12	Elementary	50.7	54.2	50.4	51.3	206.6
13	Elementary	59.2	51.9	42.9	39.3	193.3
14	Elementary	59.1	48.9	41.0	49.7	198.7
15	Combined	50.7	44.2	48.5	40.3	183.7
16	Elementary	50.7	42.8	50.5	43.8	187.8
17	Combined	42.2	45.0	41.6	39.0	167.8
18	Combined	42.2	43.7	50.1	59.7	211.7
19	Elementary	50.6	49.5	30.9	43.9	174.9
20	Combined	42.2	45.8	51.9	43.9	183.8
21	Elementary	50.7	45.8	50.2	58.4	205.1
22	Combined	59.2	48.1	51.8	47.4	206.5
23	Combined	59.1	48.1	50.2	51.3	208.7
24	Combined	42.2	48.3	51.0	55.3	196.8
25	Combined	59.1	50.4	54.5	49.1	213.1
26	Combined	42.2	51.3	44.4	44.7	182.6
27	Combined	42.2	51.3	44.4	44.7	182.6
28	Elementary	42.2	50.6	53.1	43.9	189.8

Table
(Continued)

School Board Identification Number	School Board Type	Part I: Division of Labor-General	Part II: Division of Labor-Specific	Part III: Spatial Dispersion	Part IV: Hierarchical Differentiation	Total Complexity Score
29	Combined	42.2	53.4	53.8	52.6	202.0
30	Combined	59.1	59.1	55.8	55.3	229.3
31	Combined	42.2	56.1	57.7	60.4	216.4
32	Combined	42.2	56.6	57.6	59.5	215.9
33	Combined	59.1	62.8	53.4	61.4	236.7
34	Combined	59.1	63.4	62.0	54.9	239.4
35	Combined	42.2	41.0	49.6	43.8	176.6
36	Combined	59.1	60.0	62.4	62.7	244.2
37	Combined	67.6	64.2	64.2	60.1	256.1
38	Combined	67.6	67.7	53.3	70.2	258.8
39	Combined	76.1	59.9	69.0	73.1	289.5

APPENDIX 11

ANALYSIS OF VARIANCE TABLE AND SCHEFFÉ POST HOC
ANALYSIS FOR COMPLEXITY LEVELS FOR SCHOOL BOARD
SIZE DESIGNATIONS

Table XXIII

Analysis of Variance Table for Complexity Levels
for School Board Size Designations

Sources	Number of Degrees of Freedom	Sum of Squares	Mean Square	F-value
Among Size Levels	2	19418.34	9709.17	23.44 *
Between Size Levels	36	14913.68	414.27	

* $p \leq .05$

The critical F-value with d.f.=(2,36) was 3.27. This indicated significance at the .05 level. The Scheffé post hoc examination of the data produced the following simultaneous confidence intervals:

$$U_1 - U_2 : -14.18 \pm 19.44^{N.S.}$$

$$U_1 - U_3 : -56.99 \pm 21.90^*$$

Thus, only the second contrast ($U_1 - U_3$) was significant at the .05 level.

In addition to the above two simultaneous contrasts the third possible simultaneous confidence interval between U_2 and U_3 is indicated as follows:

$$U_2 - U_3 : -42.82 \pm 20.99^*$$

Table XXIV
Scheffé Post Hoc Analysis

Contrast of Ratio Means	Lower Limit	Upper Limit	Significant*
$U_1 - U_2$	-19.44	5.26	NO
$U_1 - U_3$	-77.89	-35.04	YES
$U_2 - U_3$	-63.81	-21.83	YES

* $p \leq .05$