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# THE FUTURE PUBLIC ADMINISTRATOR AND QUANTITATIVE SKILLS

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For years scholars have devoted a great deal of time and energy describing the type of public administrator that will be needed in the future (Argyris, 1967; Bennis, 1967; Daniel, 1965; Bennis and Slater, 1968; David, 1968; Gailbraith, 1967; Mosher, 1971). An examination of that literature indicates that most prognosticators believe that various technological and societal developments will affect the shape and scope of public organizations of the future and that those changes will in turn affect the type of public administrator that will be needed.

Bennis (1967:282), for instance, argues that rapid organizational and technological changes will affect public agencies. More specifically, he feels that future public administrators will be working in an environment of cooperation rather than one of competition and an environment of uncertainty rather than one of certainty. Future public administrators, according to Bennis, must know how to analyze vast amounts of information and not merely how to process such information. Simply put, prognosticators like Bennis readily agree that future public administrators will need to be familiar with a variety of quantitative techniques and computer applications which will allow them to analyze the ever-increasing amounts of information being collected by public agencies. Concomitantly, these scholars also believe that continuing education is not only necessary but unavoidable to prevent professional obsolescence.

Since the 1960s, a number of developments have occurred which underscore this predicted need for public administrators with quantitative and computer skills. First, the 1960s saw an unprecedented expansion of public bureaucracies, particularly at the state and local levels. As public organizations grew, so did their appetites for information useful to policy-makers and program administrators and their capacities to gather such information. Computer-based data management and analysis, previously common in federal agencies and in the finance departments of larger local governments, became much more common in other kinds of operating departments and at lower levels of government. (Dutton and Kraemer, 1982:115-116)

The expanded capabilities of second generation computers, time-sharing technology, and greater interest in experimentation with computer application, as well as greater willingness on the part of local, state, and federal governments to fund the expansion of computing resources, all contributed to the increased use of computer-based data management and analysis. By the late 1960s and early 1970s, computer usage had become more sophisticated and even more common in larger public agencies. Top management personnel began assuming more active roles in the control and allocation of computer resources during this period and operating departments found it advantageous to develop their own computing staff capabilities. (*Ibid.*, 121-123)

In essence, since the 1960s public administrators have found it necessary to develop in-house computing capabilities to manage and control data useful for administrative decision-making. Administrators became more and more aware of the political uses of information and how computer-based systems can enhance agency influence on policy-making and budget-making. (Danziger and Kling, 1982) The availability of micro-computers which are less expensive and less technically demanding and the proliferation of specialized software packages, not to mention the growing sophistication and use of management information systems, promise to give added impetus to the growth of quantitative analysis and computer usage in public organizations. This growth suggests that public agencies will continue to need personnel who can use the

computer to analyze information and make decisions or who, at a minimum, possess sufficient understanding of quantitative skills to use them effectively.

One of the aforementioned points bears repeating because it may be the most important effect of increased bureaucratic size and technology. The increased use of the computer to facilitate decision-making and increase data management capabilities in public agencies, according to Kraemer and Danziger (1984:34-38), may affect the work life of public employees more directly. They conclude from their study of municipal employees that the new technologies may increase the influence of some managers and professional staff over their employees and increase such things as their sense of accomplishment in their work.

Although the responses to their questionnaire were mixed, Kraemer and Danziger found that technology influences how closely work is supervised and how much time pressure there is in certain jobs. Simply put, staff professionals who are generators and manipulators of data perceived a greater time pressure than street level bureaucrats who are largely users of data. If the job- and influence-enhancing effects of computer technology accrue primarily to those with the greater computer and analytic responsibilities (and, by implication, skills), as Kraemer and Danziger (1984:40) suggest, the need to prepare students for such roles is manifest.

The second development, actually a corollary of the first, is what has become known as the behavioral revolution. While the premises of the "revolution" may have become firmly rooted in administrative theory and organizational behavior studies and, to a lesser extent, in administrative practice, the methods evidently have not. While administrators have become aware of the need for an operating theory or framework for postulating relationships between and among variables or factors and for constructing testable hypotheses (Marini and Pugh, 1981:31), the tools for doing so have not been adequately assimilated. One of the reasons may be that public administration education has not provided the necessary analytical skills and perspectives to frame major policy or administrative questions in testable and generalizable forms. (McCurdy and Cleary, 1984)

Indeed, this lack of assimilation is a significant issue in public

administration education today if the debates at recent NASPAA and ASPA conferences are any indication of professional concern. The reaffirmation of the research imperative in public administration doctoral education at the 1983 NASPAA conference in Minneapolis and the establishment of a Research Task Force to investigate the status and role of research in public administration graduate programs offer more evidence of the deficiencies in analytical skills in those programs. The clear implication is that public administration graduate students, administrators-in-training, are neither as capable of conducting sound empirical research as they should be nor as aware of and capable of using the research of others to facilitate decision-making as they should be.

The reasons for the deficiencies may be discipline-related or generational. Citing the Hutchins-Mosher exchanges, Herbert Simon, Frederick Mosher, Robert Dahl, and others, McCurdy and Cleary (1984:49) conclude that public administration scholars "have continued to have a difficult time coming to grips with the nature of research and its role in the field." That conclusion may relate more specifically to the scholarly study of public administration with all the agendas and priorities dictated by the academic environments and career paths in which researchers find themselves. But, a similar issue was raised by Robert Denhardt at the first meeting of the Mid-America Association of Schools of Public Affairs and Administration in Kansas City, Missouri (March 1-2, 1984) when he posed the question of whether a public administration discipline exists at all as a distinct field of study or body of knowledge (also see Denhardt, 1982).

The generational difficulties may be due to the differences in analytical skills and orientations between senior level public administrators and younger administrators who have had academic preparation in public affairs and administration programs. To some extent, the demands for career or professional development that motivate many mid-career administrators to seek formal training and the natural attrition of those who joined public agencies before the trend toward "professionalization" fully developed should lessen the conflict and encourage greater appreciation and use of the analytical skills

being taught. In short, public administration education, particularly in the area of quantitative methods and computer skills, may be perceived as more relevant to the role of the public administrator as MPA degree holders advance into the higher levels of government.

However, a countervailing trend has changed the methodological orientations of academic disciplines. Post-behaviorism in a variety of manifestations has influenced social science research in recent decades to such an extent that the ambivalence of many social scientists to behavioral research may have lessened the emphasis placed on sound empirical research. In fact, that ambivalence may account for the analytical deficiencies of public administration graduate students, as noted by McCurdy and Cleary (1984) and by Waugh, Hy, and Nelson (1984). In essence, the perceived problem in public administration research may get worse rather than better as a new generation of doctoral students join the faculties of our graduate programs. Notwithstanding that prognosis, the demand for public administrators with strong analytical skills, including quantitative skills, undoubtedly will increase despite academic programs.

The third major development that may increase the projected demand for quantitatively skilled public administrators is the contraction of government fiscal resources that began in the 1970s and is expected to continue. Fiscal retrenchment and the concomitant demand for greater agency and individual productivity (the "do more with less" movement) are necessitating a reappraisal of the role of computer technology in government. Reduced costs associated with microcomputers (and budget-busting costs of mainframe computers) and "user friendly" software that encourages the use of minicomputers and microcomputers in line departments by nonspecialists, as opposed to the control of computing equipment by centralized data processing departments and professional computing staff [1] suggest (even demand) the acquisition of quantitative and computing skills simply to deal with automated office technologies. (McMillen, 1984) Specialized computer personnel may be a luxury that many agencies can no longer afford or justify.

The fourth development that has had an impact on the

demand for public administrators with quantitative skills is the accountability movement. Federal, state, and local agencies are simply being asked by their respective legislative bodies and executives to furnish evidence that allocated funds are being spent effectively and efficiently. (Hy and Brooks, 1984) Put in its simplest terms, the accountability movement means that public agencies will need administrators who have sound backgrounds in quantitative data analysis and in computer usage. Indeed, the executives who are responsible for evaluating the programs and policies will also have to have the same skills.

In many respects, the accountability movement may be the greatest stimulus to the teaching of quantitative and computer skills in public administration programs. The methodologies currently used in program and policy evaluation are sophisticated. Indeed, the state-of-the-art techniques require levels of expertise far beyond those *normally* acquired in graduate programs in public administration, although the trend may be toward less technically demanding and expensive evaluations that can be done in-house. Evaluation specialists may also be luxuries that few governments can afford.

In summary, then, the expansion of public bureaucracies and their information processing needs and capabilities, the development of a "research expectation" to justify or rationalize policy and program decisions, the fiscal retrenchment/productivity concerns that have dictated greater automation in public bureaucracies, and the growing interest in accountability and quantified and unequivocal measures of effectiveness and efficiency have all contributed to the demand for public administrators with quantitative and computer skills. The response to that demand by public administration graduate programs may be the most important development principally because the quantitative techniques that future public administrators will be using and the computer skills that they will possess are in all probability those to which they are currently being exposed in their graduate programs. It is to that development that this article now turns.

## METHODOLOGY

To determine the types of quantitative techniques and computer skills currently being taught, as well as the statistical and mathematical backgrounds of MPA students, two self-administered questionnaires were sent to the directors of graduate programs in public administration. One mail questionnaire was completed in June 1978 and the other in January 1984. Questionnaires were sent to those schools listed as members of the National Association of Schools of Public Affairs and Administration (NASPAA). Only schools with graduate public administration programs were included in the survey. In 1978, questionnaires were sent to 178 schools and 86 schools or 49 percent responded. In 1983-84, questionnaires were sent to 197 schools and 101 schools or 51 percent responded.

Schools belonging to NASPAA were selected because they generally conform to NASPAA's Standards which address the issue of quantitative skills. According to the Standards, it is expected that masters degree programs have a minimal quantitative component. That expectation may be satisfied in a number of ways, including exposure of students to methods of economic analysis (*e.g.*, benefit-cost analysis). No specific techniques are identified as essential or recommended, so a wide variety of quantitative techniques would be expected in the curricula of graduate programs.

The objective of the surveys were threefold. In the first place, they attempted to determine the quantitative background of entering students to see if they are capable of understanding and handling sophisticated quantitative techniques. Secondly, the surveys tried to assess the types of quantitative techniques to which most students in public administration graduate programs are exposed. Thirdly, the surveys attempted to ascertain the degree to which most students write their own computer programs.

A comparison of the results of the 1978 and 1983-84 surveys should indicate a trend in the types of quantitative techniques being taught to public administrators-in-training. Judging from the general trends in the use of and demand for quantitative skills in the public sector, the researchers expected that the



teaching of quantitative skills in public administration graduate programs would have increased and the data were consistent with that expectation.

### *Quantitative Backgrounds*

Public administration graduate programs are becoming more quantitatively oriented. Ninety-seven percent of the programs surveyed in 1983-84 indicate that students cannot finish their degree requirements without some exposure to quantitative techniques. This is an increase from 88 percent in 1978, although the extent of that exposure is unknown — especially since the data in Table 1 suggest that beginning graduate students normally have had little or no prior training in quantitative methods.

A number of the program directors, however, indicated that a majority of their beginning graduate students have had courses in college algebra and a few indicated that students have had basic coursework in economics and computer operations (although not programming). The comments on the 1978 survey indicated far fewer students with such training. Still, the 1983-84 responses indicated that the majority of beginning students have relatively little coursework as preparation for the more sophisticated quantitative techniques, despite the fact that 43 percent have taken basic statistics courses.

Table 1 also indicates a slight decrease in the quantitative background of entering students. The only exceptions, as noted, are those students with backgrounds in basic statistics. This finding suggests that students may not be capable of understanding the mathematical bases of the statistical techniques taught at the graduate level. Apparently, "cookbook" statistics are considered sufficient to meet the quantitative requirements of potential public administrators. While not quarreling with this suggestion, the researchers do think that it should be recognized as quite commonplace. Perhaps more bothersome are the low percentages of students with prior preparation in research methods and the philosophy of science.

### *Types of Quantitative Techniques*

TABLE 1  
 QUANTITATIVE BACKGROUNDS OF BEGINNING MPA STUDENTS

Preparatory Courses	N	1978 %	N	1984 %
Research Methods	18	22	23	23
Data Processing	8	10	9	9
Basic Statistics	29	36	45	45
Calculus	5	6	5	5
Matrix Algebra	6	7	4	4
Vector Analysis	0	0	1	1
Differential Equations	1	1	1	1
Computer Programming	5	6	5	5
Philosophy of Science	*	*	2	2

\*Not asked

TABLE 2  
TYPES OF QUANTITATIVE TECHNIQUES BEING TAUGHT

TECHNIQUES OR TOOLS	1978		1984	
	N	%	N	%
Measures of Central Tendency	74	91	96	95
Measures of Dispersion	75	93	96	95
Tabular Statistics	68	84	93	92
Linear Statistics	79	89	93	92
Partial Correlation	47	58	64	63
Linear Regression	67	83	93	91
Nonlinear Regression	17	21	37	37
Factor Analysis	12	15	33	33
Nonparametric Statistics	22	27	44	44
Analysis of Variance	46	57	74	73
Analysis of Covariance	21	26	45	45
Time Series Analysis	31	38	47	47
Linear Programming	30	37	48	48
Simplex Algorithms	15	18	15	15
Inventory Analysis	13	16	16	16
Network Analysis	18	22	30	30

TABLE 2 (cont.)

TECHNIQUES OR TOOLS	1978		1984	
	N	%	N	%
Markovian Decision Process	9	11	14	14
Monte Carlo Methods	11	14	21	21
Queuing	23	28	34	34
Nonsimplex Algorithms	2	2	3	3
Dynamic Programming	2	2	2	2
Integer Programming	4	5	2	2
Bayesian Decision Models	23	28	31	31
PERT/CPM	38	41	51	50

The types of quantitative techniques taught in graduate programs of public administration vary tremendously. Some programs expose a majority of their students to a wide variety of techniques, while others expose them to only a very few. As Table 2 suggests, social science statistics were preferred to management science techniques.

The Table also shows that the most popular management science techniques were PERT/CPM, linear programming, time series analysis, Bayesian decision models, queuing, and network analysis. Measures of central tendency and dispersion, tabular statistics, and linear statistics are the most widely taught social science statistics. A few, but not many, programs taught benefit-cost analysis, decision trees, path analysis, and multi-dimensional scaling.

Furthermore, Table 2 indicates that public administration graduate programs are exposing students to more quantitative techniques than they did in 1978. In almost every instance, the 1983-84 percentages are higher than those from 1978.

As shown in Table 2, prewritten statistical packages for computer-designed analysis are more readily available today than they were in 1978. Table 3 presents the use of prewritten packages.

The most commonly used packages, by far, is SPSS. It is also notable that most of the program directors who indicated that a majority of their students learn to use SAS also listed SDSS as a commonly used package. Evidently the other packages are used by very few students and very few students are required to write their own programs. A variety of other packages, including minicomputer and microcomputer statistical packages and packages designed for specific mainframe computers (usually purchased with the mainframes or provided by the mainframe vendors) are being used but only by a few graduate programs.

## IMPLICATIONS

The findings indicate a trend which supports the previously cited contentions of the researchers that future public administrators will be familiar enough with quantitative techniques and computer usage to allow them to analyze large amounts of

TABLE 3  
 STATISTICAL PACKAGES BEING USED IN MPA PROGRAMS

Packages	1978		1984	
	N	%	N	%
SPSS	67	83	84	83
SAS	17	21	27	27
OSIRIS	6	7	3	3
BMD/BMDP	16	20	3	3
MINITAB/OMNITAB	5	6	6	6
VELDMAN	1	1	0	0
Students Required to Write Own	9	11	6	6
Other	14	17	13	13

information quickly and precisely simply because public administration programs are increasingly teaching such techniques to future public administrators. Quantitative techniques and computer applications, it is believed, will become more widely used than the trend suggests because this generation of administrators will have received a large dose of training in these techniques. As these administrators move into positions of influence and up the administrative hierarchy, they will use (and insist that their subordinates use) quantitative techniques even more frequently than such techniques are currently being used.

Since the computer price revolution has made it possible for every agency to purchase hardware and software, each agency now can have easy access to computer solutions to almost any quantitative techniques. (The availability of the techniques, of course, is directly related to its ease of access.) As these techniques become more accessible, they will be used more frequently.

It is also more apparent that the quantitative backgrounds of future public administrators are not too sophisticated. The backgrounds of beginning graduate students show some quantitative deficiencies. (Unless prerequisites are used, quantitative courses may not be a good indication of the actual quantitative preparation of future administrators.) Such deficiencies suggest that future administrators probably are learning "cookbook" statistics and are not understanding the mathematical bases as well as the full potentials and limitations of the techniques that are being used.

As a result, one of two things may be occurring. First, future public administrators may be learning *about* the techniques rather than the techniques themselves. Such an approach, unfortunately, leads to the suspicion that the users may be unable to apply some techniques, especially the more sophisticated ones, to unfamiliar situations. For instance, they may be able to apply a linear programming technique to a dietary problem — as shown in a class or textbook — but be unable to use linear programming to solve a bussing problem. Second, future administrators may be learning how to interpret computer printouts without being familiar enough with the

techniques to be conversant with specialists.

Reliance on SPSS and/or SAS for computer-assisted quantitative analysis is almost universal. Their popularity probably is due to the relative ease with which the programs can be used, especially by those persons who do not have strong mathematical and computing backgrounds. In fact, the reliance on only a few prewritten packages such as SPSS and SAS suggests that those packages may themselves provide common skills for future public administrators.

The "cookbook" approach means that future public administrators probably will use social science statistics rather than management science techniques. Moreover, the quantitative techniques that are used may well be determined by the prewritten statistical packages that are available. Simply put, the techniques incorporated by SPSS and SAS will be the ones most widely used by future administrators.

## NOTES

1. Norris (1984:75). Of 76 local governments with in-house computing facilities, 61.8% indicated that they do not employ a computer programmer and a like number (60.5%) indicated that they rely on commercial software rather than in-house or borrowed programs.

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