THE ROLE OF STANDARDS IN GRAPHIC PRESENTATION

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Standards are a universal ingredient of every type of orderly human relationship whether it be in government, business, industry, religion, science or in any other area or activity. Since "standard" and "standardization," two widely misunderstood and misused concepts, will be cited repeatedly in this discussion, it is essential at the very beginning to define them with some degree of clarity and specificity. A "standard" is a criterion, unit of reference, model or process approved or accepted as correct by common consent, established custom, or recognized authority. Frequently, standards evolve without conscious direction through such processes as common practice, imitation, and precedent. Also, standards may be formalized and systematized through consensus by special committees or groups created for such purpose. Standards exist in different forms such as (1) a document or systematized formulation containing a set of conditions to be fulfilled in accordance with specified rules and directions; (2) a fundamental unit or physical constant (examples: ampere, absolute zero); (3) an object for physical comparison (examples: meter, liter). "Standardization" is the process of formulating and applying rules for an orderly approach to a specific activity. Standardization is not a series of mandatory edicts; it is not a strait jacket of conformity; nor is it an exposition of dull, drab rules. Standardization means consensus and cooperation for the purpose of attaining optimal economy and efficiency. It is a form of conscious planning based on the consolidated results of science, techniques and experience. Some particular applications include: (1) units of measurement; (2) terminology and symbolic representation; and (3) rules and instructions pertaining to products and processes.[1]

With respect to the origin of standards, a general distinction can be made between those that are based on habit, custom or tradition which can be designated "natural standards," and those that are the result of conscious planning which can be designated "organized standards."[2] Certainly in graphic presentation as in other fields both "natural" and "organized" standards will be found.

For those of you who still retain at least a distant memory of introductory sociology will recognize that "natural standards" possess a meaningful similarity if not identity to such concepts as folkways, customs, mores, norms, and other elements of normative systems in human society. In fact, they may be referred to properly as standards of behavior. Characteristically, these elements and patterns develop spontaneously and unconsciously and serve as standards and guides to human conduct. As a society grows and becomes more complex the "natural" patterns and standards based on tradition and experience evolve into formal prescriptions and laws. This change exemplifies the transformation of "natural" standards into "organized" standards.

The following example will provide a historical glance of this process, as illustrated by the transformation of standards of linear measurement from crude and informal beginnings to more objective and precise criteria. Many centuries ago

> . . . it was sufficient that various parts of the human body serve as measuring units since they were handy and required no unusual skill to use. For instance, one of the earliest standards of measurement was the cubit, which was the length of the forearm from the point of the elbow to the tip of the middle finger. Later the inch was the width of a man's thumb; the foot was the length of the reigning king's foot; and the yard was the distance from the thumb to the tip of the nose. During one period the standard for the inch even became the length of three pieces of barleycorn from the "middle of the ear."
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> In time, with the increase in commerce and communication, it became obvious that units of measurement could not be based on variables such as thumbs, elbows, noses and corn.
>
> . . . The French revolution not only brought drastic social and political innovations, but also gave birth to the metric system. This introduces a comprehensive decimal system having as a basis the meter, which was taken as the one ten-millionth part of a meridional quadrant of the earth.[3]

It is significant to observe that it is not uncommon for widespread resistance to develop against the adoption of new and demonstrably superior standards. As you know, many years passed before the metric system was adopted as the obligatory system in France and other countries. As far as the United States is concerned a Congressional act was passed in 1866 making it "lawful throughout the United States of America" to employ the system and defining meter in terms of inches. In recent years much is heard about the adoption of the metric system but it will be several decades before any substantial transition to the metric system is achieved. Such factors as cost, confusion and general cultural inertia preclude any rapid changeover of this kind.

Industrial Standards and Standardization and Their Influence on Standards of Graphic Presentation

A preliminary discussion of standards and standardization would be seriously deficient if at least brief reference were not made of the impressive role of industrial standardization, both nationally and internationally. Because of its pervasive influence on every facet of our economy its true significance and impact on modern technological civilization is not fully grasped. However, it can be said that "The partnership between science and standards holds the secret to the extraordinary dynamism and productivity of modern industrial technology."[4] "Without standards, our present-day economy would be a shambles --in fact, it might never have come into being."[5]

For several decades thousands of private organizations and individuals along with numerous governmental agencies have been actively involved in the industrial standardization movement. Many professional organizations and agencies such as the American National Standards Institute, the American Society of Mechanical Engineers and the United States Bureau of Standards have played key roles.

The industrial standardization movement by providing a pervasive stimulus exerted an influence in the origin and development of standards of graphic presentation. Willard C. Brinton, a professional engineer, through the American Society of Mechanical Engineers was largely responsible for the original Joint Committee on Standards of Graphic Presentation. Subsequent committees that revised and expanded the original standards were sponsored by the American Society of Mechanical Engineers functioning under procedures and requirements of the American National Standards Institute.[6]

Brief Historical Background of Standards of Graphic Presentation

In an effort to acquire a better understanding of the significance and purpose of standards in graphic presentation, an historical perspective will be found particularly helpful. Accordingly, consideration will be given to a brief historical account of graphic presentation, highlighted by certain facts pertaining to standards and standardization.

The origin of statistical charting techniques, as we think of them today, dates back to 1786--less than 200 years--when William Playfair published his famous work entitled The Commerical and Political Atlas. Two subsequent editions of this book were published in 1787 and 1801. It must be recognized, of course, that in studying the history of graphic techniques many basic developments such as the principle of coordinates and the invention of analytic geometry, antedate the work of Playfair. Nevertheless, William Playfair can properly be considered the "father" of graphic presentation.

Playfair, in refering to his new system as "lineal arithmetic" explains that

> The advantage proposed by this method, is not that of giving a more accurate statement than by figures, but it is to give a more single and permanent idea of the gradual progress and comparative amounts, at different periods, by presenting to the eye a figure, the proportions of which correspond with the amount of the sums intended to be expressed.[7]

Furthermore, he states

> That I have succeeded in proposing and putting in practice a new and useful mode of stating accounts, has been so generally acknowledged, . . . as much information may be obtained in five minutes as would require whole days to imprint on the memory, in a lasting manner, by a table of figures.[8]

It must not be overlooked that when Playfair published his original contributions, including the line graph, circle graph, bar graph and pie diagram the word "statistics" had not yet appeared in the English language, few collections of reliable quantitative data were available, and the development of statistical method was still far in the future.[9]

Standards and standardization are nothing new in graphic presentation. When Funkhouser wrote his well-known history of graphic presentation in 1937, he stated that "the problems met in trying to classify and standardize graphic forms have been wrestled with for almost a hundred years."[10] During the early history of graphic presentation, the significance of these problems as well as the manner in which they were considered are reflected in the proceedings of the nine International Statistical Congresses that were held in Europe from 1853 to 1876. Subsequently, the International Statistical Institute which was organized in 1885 gave serious consideration to standards of graphic presentation. Graphic techniques were discussed at considerable length at the International Statistical Congress held in Vienna in 1857. For many years, concomitant with the rapid growth of graphic presentation, many statisticians believed that an effort should be made to regulate graphic procedures and to provide rules for the purpose of achieving uniformity and comparability. In the Hague Congress of 1869 a resolution was passed recommending that the "organizing commission of the next Congress prepare a memoir on the different graphic methods employed in statistics and on the proper means of rendering the graphic tables uniform and comparable."[11] Accordingly, in the ensuing Congress held at St. Petersburg in 1872, this issue was faced head on. After extended discussions and debates before the general assembly it was concluded that "As for uniformity of diagrams, properly called, the Congress declares that the time has not yet come to prepare uniform rules."

> The issue on uniformity of graphic procedures was not drawn as sharply again. Most statisticians came to realize that, although some standard practice in the drawing of diagrams was desirable, the type of regulation urged at the St. Petersburg Congress was both foolish and impractical. For the next forty years the matter was debated informally at statistical gatherings and by various writers but nothing constructive was accomplished.[12]

Following the last statistical Congress in 1876 in Budapest, and an ineffectual attempt to hold an assembly in Rome in 1880, the International Statistical Institute was organized at the jubilee of the London Statistical Society in 1885. At the sessions of the International Statistical Institute in 1901, 1908, and 1913 serious attempts were made to develop rules and standards for graphic procedures, but they all met with failure.

American Joint Committee on Standards for Graphic Presentation

Meantime in 1914 in the United States, largely through the efforts of Willard C. Brinton, the American Society of Mechanical Engineers extended invitations to a number of interested American scientific societies to participate in a joint committee for the purpose of developing standards of graphic representation. Seventeen associations and agencies cooperated in the formation of the committee. The initial meeting of the committee was held in December 1914. The first report, described as preliminary, was published in 1915.[13] The report was relatively brief, consisting of 17 simply stated basic rules, each illustrated with from one to three diagrams. Fourteen of the rules including the accompanying diagrams were devoted exclusively to the portrayal of time series in the form of arithmetic line charts. Of the three remaining rules, one emphasized the preference of linear magnitudes over areas or volumes; one represented a simple procedure pertaining to semi-logarithmetic charts; and one, the desirability of emphasizing the 100 percent or other base line in the delineation of an arithmetic grid.

Since the publication in 1915 of the report by the original Joint Committee, other committees prepared greatly expanded reports on standards of graphic presentation in 1936, 1938, and 1960.

Present-Day American National Standards Committee on Preferred Practice for the Preparation of Graphs, Charts and Other Technical Illustrations

At the present time, there is a permanent committee on standards of graphic presentation, officially known as Y15 American National Standards Committee on Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations. It was organized in 1926 and re-organized in 1949. There are many American National Standards Committees, mostly in business and industry, that have been organized and are functioning under the auspices and in accordance with certain rules and specifications of the American Standards Institute. The sponsor for Y15 American National Standards Committee on Preferred Practice for the Preparation of Graphs, Charts and Other Technical Illustrations is the American Society of Mechanical Engineers.

Because of limitation of space, it will not be possible to present a detailed explanation of the methods and sanctions specified by the American Standards Institute in establishing an American National Standards Committee. However, an attempt will be made to provide a meaningful sense of some of the more basic requirements and procedures especially as they apply to the American National Standards Committee on Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations.[14]

1) The American National Standards Institute shall consider any written request to establish an American National Standards Committee.

2) Such requests shall include the (a) proposed scope of the committee, (b) a history of standardization work in this field and (c) a list of organizations having a substantial concern with, and competence in, the proposed scope.

The official scope of ANSC on Preferred Practice for the Preparation of Graphs . . . is as follows: "The recommendation of preferred practices for the design and preparation of graphs, charts, and other technical illustrations, including consideration of special requirements for publication or projection."

3) Every ANSC is required to have a secretariat (sponsoring organization) that is charged with certain specified functions and responsibilities, such as: (a) carrying out the Institute's procedures for the ANSC; (b) determine representatives on the ANSC; (c) propose programs of work, together with proposed completion dates; give direction and guidance to the ANSC; and (d) carry out administrative work, including secretarial service.

The secretariat for the ANSC on Preferred Practice for the Preparation of Graphs . . . is The American Society of Mechanical Engineers.

4) Membership on an ANSC is of three types: (a) representatives of organizations "willing to participate and having substantial concern and competence in the scope of the Committee"; (b) "individuals possessing expert knowledge in the field of the Committee's work"; and (c) under certain conditions "companies having substantial concern and competence in standards within the Committee's scope."

The present ANSC on Preferred Practice for the Preparation of Graphs . . . is composed of 16 members: 12 representing professional and trade associations; 3 individual members; and 1 industrial member ("telephone group"). In addition there are 2 alternate members. Significantly, and strangely, the American Statistical Association is not represented on this Committee. Moreover, according to the 1970 directory, not a single one of the 16 members and 2 alternate members of the Committee are members of the American Statistical Association. In contrast, among the 17 members of the original Joint Committee in 1915, the American Statistical Association was represented by Leonard P. Ayres who was elected secretary of the Committee. The chairman of the Committee, Willard C. Brinton, was a former vice president of the American Statistical Association. In addition there were other well known statisticians such as Robert E. Chaddock, Edward L. Thorndike, and Joseph A. Hill who served on the Committee. In the 1930's, when the 1936 issue of Code of Preferred Practice for Graphic Presentation--Time-Series Charts and the extensive 1938 revision entitled Time-Series Charts--A Manual of Design and Construction were published, the American Statistical Association was represented by Karl G. Karsten. In the 1960 revision, the professional society affiliation of the members of the subcommittee responsible for this report is not indicated. However, three of the nine members

are members of the American Statistical Association.

Original American Standards as Well as Subsequent Revisions Devoted Exclusively to Time-Series Charts

The standards of graphic presentation published originally in 1915 along with the extensive revisions and additions promulgated in 1936, 1938 and 1960 are excellent examples of rationally organized and formalized standards. Without seeming repetitious, it should be emphasized that for the most part these standards existed long before 1915. They evolved over the years through practice, experience, imitation and precedent. Those responsible for the published formalized standards were basically codifiers and organizers who selected and refined certain rules, procedures and practices through discussion, evaluation and consensus. A careful examination of the published standards of graphic presentation, valuable as they have been, are limited in application since they are concerned exclusively with time-series charts.

For example, in the 1938 edition of Time-Series Charts: A Manual of Design and Construction over 50 pages are devoted to arithmetic line charts, 3 pages to time-series column charts and 2 pages each to surface charts and semi-logarithmetic charts.

Apparently, the rationale for selecting time-series charts as a basis for formulating standards was their extensive use and widespread familiarity. According to the 1938 edition of the Manual:

> Probably three quarters of all charts prepared employ time as one of the variables. Of the various types of time-series charts, the socalled "line chart" is most frequently used, and therefore is given the most space and is discussed in the most detail.[15]

The committee that prepared the 1960 revision continued the emphasis on time-series charts.

> The objective of the original committee who prepared the earlier version of this manual in 1938 was to bring together the principles and procedures found successful in constructing time-series charts. The objective of the present committee has been to review these principles and to revise the procedures to agree with current practices.
>
> In the years since the original manual was prepared, many of the practices used in the preparation of time-series charts have changed.[16]

In the 1960 revision 62 pages are devoted to time-series arithmetic line charts, 5 pages to time-series column charts, 3 pages to time-series surface charts and 6 pages to time-series semi-logarithmetic or ratio charts.[17]

It would be difficult to fault the committees (1914, 1936, 1938 and 1960) for the selection of time-series charts as the graphic form as a basis in the formulation of standards of graphic presentation. They possess a long tradition, are familiar to most people and are extensively used. However, during the past few decades other graphic forms have assumed increasing importance. In order to determine with a reasonable degree of reliability, the frequency of use of various types of charts, a survey far beyond the scope of the present paper would be required. The extent to which the various graphic forms are used is based on such general and specific factors as the following: field of study, characteristics of the data, cost, audience to whom the study is addressed, objectives of the study, and knowledge and expertise of the author.

For the purpose of deriving clues to the comparative extent to which certain types of graphic forms are utilized at the present time, let us consider a few recent studies. All of the studies are in the social sciences. The first is Social Indicators 1973 with more than 165 charts.[18] This monograph has received considerable attention from various groups as well as from individual scholars. Although, according to the introduction of this report "the indicators presented . . . are primarily time series," only 84, or 50.9 percent of the total of 165 charts can be classified as time-series charts. Specifically, 76 are arithmetic line charts, 6 are semi-logarithmic and 2 are surface or stratum charts. The remaining 81, or 49.1 percent consist of 73 bar and column charts, 5 histograms, 2 maps and one age-and-sex pyramid.[19] Three of our own recent studies, one devoted to a statistical and ecological study of Crime and two to demographic and ecological studies of Nonwhite Races and The Growth of Towns and Cities include a total of 271 charts.[20] Of the total of 271 charts only 7, or 2.6 per cent are arithmetic line charts. There are 11 other arithmetic time-series charts--10 surface or stratum charts and one column chart. In addition, there are 47 semi-logarithmic charts devoted to time series. The 18 arithmetic and 47 semi-logarithmic time-series charts comprise 24.0 percent of the total in the three monographs. The remaining 206 charts include cross-hatched maps, different kinds of spot maps, maps with 2- and 3-dimensional symbols, maps in perspective and in oblique projection, frequency polygons, bar graphs, correlations matrices, age-and-sex pyramids, organizational and flow charts and profile charts.

Non-Time-Series Charts and Standards of Graphic Presentation

Regardless of the precise percentage, there is no doubt that at the present time graphic forms other than those devoted to time-series comprise a very large proportion of charts in the armamentarium of the graphic specialist. Logically, this raises two significant questions with respect to standards of graphic presentation: First, what standards if any, exist for graphic forms other than time-series charts? and second, has the time arrived when a concerted effort should be made to formulate standards for at least some of the non-time-series charts?[21]

Apropos to the first question, standards for all the manifold graphic forms not classified as time-series charts do exist although they have not been explicitly organized and sanctioned through collective action by a special committee or organization. These standards are very real and meaningful and are an integral part of the discipline; they give direction to basic criteria, practices and techniques. They are commonly embodied in text books and manuals on graphic presentation. The value and utility of the standards thus presented depend upon the fidelity with which the standards conform to the best state of knowledge relating to the theory and practice of graphic presentation.

Because of the complex implications of the second question, "has the time arrived when formalized standards for certain non-time series charts to be promulgated?" a more than simple categorical yes-or-no answer is required. I believe that an appropriate and realistic answer can be achieved only after careful study by a committee of experienced and knowledgeable specialists from a number of relevant disciplines.

When graphic presentation is properly thought of as a graphic language, a form of visual communication, it can be readily seen how standards in graphic presentation are analogous to rules of grammar in the spoken and written language. As standards become more explicit and formalized through rational evaluation and consensus, graphic presentation can rid itself more easily of provincialisms, uncertainties, eccentricities and inconsistencies.

Standards should never be treated as ultimates. Sound standards of graphic presentation embody the best current usage, and are based on "general agreements" rather than on "scientific test." In the future perhaps, certain aspects of "general agreement" can be substantiated by "scientific test." Standards define knowledge at a point in time, usually by stating what is "best" when judged by some set of criteria. When knowledge increases or criteria change, standards must and do change. As experience in the field of graphic presentation broadens and deepens, and as new problems occur, changing practices are inevitable. New standards are created, and other standards become outmoded.[22]

Charts in General Publications as De Facto Standards of Graphic Presentation

Published charts, whether "good" or "bad" may have an impact not unlike existing standards since they are sometimes unconsciously imitated or used as models by those designing charts. Also, innovations and precedents may be established by this process. The influence of a publication may be particularly significant if it is prestigious and widely read. For example, during the more than 50 years since its publication, the 154-page volume by Leonard Ayres which was devoted to certain military aspects of World War I has been cited a number of times for the exemplary quality of its charts.[23] For example, one writer states that "It is probably one of the best graphic works done in this country up to that time."[24] Another writer indicates that this volume "contains some of the best graphic work done in the United States."[25]

On the other hand, a volume containing a large number of charts of poor quality may have an opposite influence. It is a disservice to the reader and to the discipline to publish poorly designed and executed charts. The graphic material, comprising 165 charts in a widely recognized volume--Social Indicators, 1973--which was previously cited in this paper is a case in point. For example, all of the 76 arithmetic line charts are aberrant and idiosyncratic in design and most of the remaining 89 charts are mediocre or actually violate accepted standards of graphic presentation.

In this connection it is significant to note that the Social Science Research Council sponsored a review symposium of this volume in which 37 statisticians and social scientists participated. A monograph comprising the basic proceedings of this symposium was published in 1974.[26]

In spite of the fact that the volume under review is referred to in the introduction of the Symposium as a "chartbook," and that well over half of the space in the volume under review is devoted to charts, there is virtually nothing in the Symposium on an evaluation of the graphic material. The symposium does include a cursory discussion of four charts in the context of specific statistical problems along with the puzzling statement that "the graphics are among the best we have seen in such a report, not only because of the helpful use of color, but also because the authors have generally observed relatively high standards of presentation."[27]

Role and Importance of Internal Standards

Although an extensive body of general standards, national or even international in scope, may exist for a particular discipline or other established area, it is a common expendient for constituent organizations or other entities to modify or supplement existing standards for the purpose of fulfilling their own special needs. In fact, in industry and business there are very few large organizations that have not established their own files of internal or in-house standards. Customarily, one or more members of the managerial staff is given the responsibility of preparing, coordinating, maintaining and disseminating both general and in-house standards.[28]

In the field of graphic presentation many organizations and agencies have prepared standard codes or compilations for internal use. These codes are frequently reproduced in the form of printed manuals which may also include specifications and standards for tabular and textual presentation. The following are a few examples: Department of the Army, Standards of Statistical Presentation, Pamphlet 325-10, April 6, 1966; National Institutes of Health, Manual of Statistical Presentation, Division of Research Grants, Statistical Item Number 10, January 1970; United States Department of Agriculture, Office of Management Services, Tips on Preparing Chart Roughs, Washington, D.C., 1973. Not infrequently,

a treatise on graphic presentation may serve as an internal standards guide. When I was in charge of the Center for Studies in Demography and Ecology at the University of Washington and of the Washington State Census Board, my Handbook of Graphic Presentation along with a file of a few hundred charts from previous studies comprised our internal standards guide.[29]

The practical importance of internal or "company" standards of graphic presentation is exemplified by the following uses and benefits:

1) They serve as important guides in maintaining uniformity and consistency for many repetitive and recurring procedures.
2) They represent an important educational tool by facilitating the training and indoctrination of new employees, thereby relieving the supervisory staff of time and effort.
3) They can be helpful in enhancing the quality of work by developing procedures based on experience, collaboration and consensus.
4) They can reduce costs by increasing the efficiency and economy of basic procedures.
5) Standards represent a distillation of experience which can be retained and perpetuated without dissipating time and energy in constantly retracing or reinventing certain procedures.

Concluding Remarks

In addition to the usual conventional comments, the concluding remarks of this discussion will attempt to provide a broader perspective to the role of standards by relating standards to certain facts and issues concerning recent and future trends in graphic presentations.

In order to maintain and improve the quality of graphic presentation there is no doubt that sound and generally acceptable standards are indispensable. From a long-time perspective, I believe the chief concern of most specialists working in this area is to improve the quality, effectiveness and acceptability of graphic presentation as a graphic language--a medium of visual communication. It would be wishful thinking to assume that standards alone could achieve such a goal. Even the most theoretically acceptable, technically sound, and complete standards per se are of no consequence unless they are widely known, understood and applied. From observation over the years, one is compelled to conclude that a significantly large proportion of published charts are prepared by persons with little or no knowledge of standards, to say nothing of other aspects of graphic presentation.

Standards, though indispensable, constitute only one facet of a large body of theoretical principles, substantive facts and practical know-how which comprise the art of graphic presentation. All of these varied elements are interrelated and interdependent. In the preparation of charts, standards provide essential guides and direction, but in addition a wide variety of other knowledge as well as skills and techniques are required.

One of the most unprecedented developments in the field of graphic presentation has been the utilization of electronic computers and auxiliary equipment in the preparation of statistical charts. This development has occurred during a span of approximately two decades, with the last five years representing a period of spectacular change. Thus far, the most significant and productive application of computer techniques in graphic presentation has been statistical mapping. This fact is evidenced by a proliferation of computer mapping systems and technologies. It has been convincingly demonstrated that computerized techniques occupy a very essential place in graphic presentation, and as far as the future is concerned further applications and developments in computer technology can be expected.

As Dr. Bachi points out, a significant factor which inevitably will operate as an accelerating force is the unprecedented output of statistical information largely from the proliferation of automation.[30] It has been estimated that by the end of the next decade new information will be generated and circulated at six times the present rate and 20 to 25 times the volume of a mere fifteen years ago. In order to produce this veritable avalanche of information "the number and processing capacity of systems which are now in operation will have to be multiplied by a factor of 50 or 100."[31] As a consequence, graphic techniques should assume a more important role as a tool for interpreting and mastering large masses of data.[32]

However, it cannot be emphasized too strongly that electronic computers are no substitute for a thorough knowledge of basic theory and practice of graphic presentation. Standards or lack of standards are based on man-made decisions. No amount of sophistication in computer technology can replace personal insight, experience and expertise in the art of graphic presentation.

In recent decades, statisticians by and large have become indifferent and neglectful of graphic presentation. As far as the main stream of contemporary statistics is concerned, graphic presentation has been shunted into a marginal niche. This trend is clearly reflected in the programs of statistical societies, in statistical journals, in university courses in statistics and in treatises on statistics. For several decades the American Statistical Association had a standing committee on graphic presentation, but after 1954 and up to the present time, it has ceased to exist. As indicated previously, the American Statistical Association is no longer represented on the American National Standards Committee on Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations and not a single member of this committee is affiliated with the American Statistical Association. One observes that with growing indifference and neglect, the incidence of graphic illiteracy--"graphicacy" according to Albert Biderman's neologism--among statisticians seems to have increased. This observation can be substantiated by the clumsy and amateurish charts produced by or under the direction of statisticians.[33]

However, during the past two or three years there are indications of a renascent interest in graphic presentation among many statisticians.

This trend is attested to by the work now in progress under the leadership of Albert Biderman, the newly established Council on Social Graphics, the program initiated by Roberto Bachi on Graphical Methods at the 1975 biennial meeting of the International Statistical Institute, today's program organized by Vincent Barabba as well as other activities. A climate conductive to the progressive development of graphic presentation in terms of higher standards, improved techniques, better trained specialists, and wider acceptability is more favorable today than it has been in several decades. Hopefully, the impetus that has been started will continue without serious interruption.

In concluding this discussion, I believe it would be appropriate to present a few comments concerning standards that pertain to another aspect of graphic presentation which thus far has not been mentioned. I refer specifically to professional standards--standards of professional competence. Questions relating to the progressive development of the discipline itself as well as the achievement of higher levels of professional competence are interrelated. In this connection one of the most serious impediments to the improvement of professional standards is the lack of adequate training programs in graphic presentation. Because of their crucial importance, I trust that questions relating to professional standards, training programs, as well as other needs and shortcomings of graphic presentation as a discipline will be given the attention they deserve at some future meeting.

Footnotes

*I am indebited to Stanton E. Schmid of the University of Washington for a critical reading of the manuscript and for offering constructive suggestions.

1/ Excerpted and in part reworded from International Standards Organization (ISO), and Arnold M. Rosenwald in Rowen Glie (ed.), Speaking of Standards, Boston: Cahners Publishing Company, 1972, pp. 34-35 and pp. 152-153.

2/ J. Gaillard and Madhu S. Gakhale in Rowen Glie, Ibid., p. 16.

3/ P. G. Belitos, "The Challenge of the Decimal Inch," The Magazine of Standards (April 1961), pp. 100-105.

4/ Dickson Reck (ed.), National Standards in a Modern Economy, New York: Harper and Brothers, 1956, p. ix.

5/ Jack Rogers, "Industrial Standardization, Company Programs and Practices," Highlights for the Executive, Studies in Business Policy, No. 85, National Industrial Conference Board, 1957, p. 3.

6/ Prior to August 1966, the American National Standards Institute was named the American Standards Association.

7/ William Playfair, The Commerical and Political Atlas (third edition) London: J. Wallis, 1801, pp. ix-x.

8/ Ibid., p. xii. For a more extensive discussion of Playfair, see H. I. Funkhouser and H. M. Walker, "Playfair and His Charts," Economic History, Vol. III (1935), pp. 103-109.

9/ H. I. Funkhouser, "Historical Development of the Graphical Representation of Statistical Data," Osiris, Vol. 3 (1937), p. 280.

10/ H. I. Funkhouser, Ibid., p. 271.

11/ H. I. Funkhouser, Ibid., p. 317.

12/ H. I. Funkhouser, Ibid., p. 319.

13/ Joint Committee on Standards for Graphic Presentation, "Preliminary Report Published for the Purpose of Inviting Suggestions for the Benefit of the Committee," Publications of the American Statistical Association, Vol. XIV (1914-15), pp. 790-797. This report was also published as a separate pamphlet by the American Society of Mechanical Engineers.

14/ The following summary statements were excerpted and partially re-written from American National Standards Institute procedures furnished by L. E. Farragher, Standards Engineering Administrator of the American Society of Mechanical Engineers.

15/ Committee on Standards of Graphic Presentation, Time-Series Charts: A Manual of Design and Construction, New York: The American Society of Mechanical Engineers, 1938, p. 6.

16/ Subcommittee Y15.2 of the Committee on Preferred Practice for the Preparation of Graphs, Charts and Other Technical Illustrations, American Standard Time-Series Charts, New York: American Society of Mechanical Engineers, 1960, p. 1.

17/ "At the present time, the subcommittee for Y15.2, Time Series Charts, is preparing a revision for this standard. Work is just starting on this project and little has been accomplished, as yet. The existing standard, completed in 1960, is slightly out of date and not much, in my opinion, needs to be changed."--Quoted from a letter by Francis Saint, Chairman, Y15 Committee, July 20, 1976.

18/ Executive Office of the President: Office of Management and Budget, Social Indicators, 1973, Washington, D.C.: Government Printing Office, 1973. There are 165 numbered charts in this study. Actually there are more charts since it will be found that two or three distinct charts are sometimes included under a single number.

19/ Age-and-sex pyramids, of course, are generically double histograms.

20/ Calvin F. Schmid and Stanton E. Schmid, Crime in the State of Washington, Olympia: Washington State Planning and Community Affairs Agency, 1972; Calvin F. Schmid, Charles E. Nobbe, and Arlene E. Mitchell,

Nonwhite Races, State of Washington, Olympia: Washington State Planning and Community Affairs Agency, 1968; Calvin F. Schmid and Stanton E. Schmid, Growth of Towns and Cities, State of Washington, Olympia: Washington State Planning and Community Affairs Agency, 1969.

21/ Of course, in this connection it must be recognized that a certain body of standards are applicable to a greater or less degree to all graphic forms.

22/ Subcommittee Y15.2 of the Committee on Preferred Practice for the Preparation of Graphs, Charts, and Other Technical Illustrations, Loc. Cit.; Jack Rogers, Op. Cit., p. 5.

23/ Leonard P. Ayres, The War with Germany, A Statistical Summary, Washington, D.C.: Government Printing Office, 1919. There are 60 "diagrams" and 12 "maps" in the report. Judged in terms of present-day standards, most of the charts would have a high rating. However, several bar charts without scale lines and scale figures would be classified as deficient.

24/ Paul J. Fitzpatrick, "The Development of Graphic Presentation of Statistical Data in the United States," Social Science, Vol. 37 (October 1962), pp. 203-214.

25/ H. I. Funkhouser, Op. Cit., p. 375.

26/ Roxann A. Van Dusen, Social Indicators, 1973: A Review Symposium, Washington, D.C.: Social Science Research Council, 1974.

27/ Ibid., p. 68.

28/ Frequently, such functionaries are called standards engineers. Standard engineers represent an established profession with an autonomous organization and journal.

29/ Calvin F. Schmid, Handbook of Graphic Presentation, New York: The Ronald Press Company, 1954.

30/ Roberto Bachi, "Graphic Methods: Achievements and Challenges for the Future," presented at the Fortieth Session of the International Statistical Institute, Warsaw, Poland, September 1-9, 1975.

31/ Georges Anderla, "The Future of Information for Governments and Society," OECD Observer (Organization of Economic Cooperation and Development), No. 63 (April 1973), pp. 27-32.

32/ In this connection, as a significant historical note, in 1915 one of the most cogent reasons for formulating standards of graphic presentation was the increasing volume of information. According to the report of the original Joint Committee on Standards for Graphic Presentation,

> As civilization advances there is being brought to the attention of the average individual a constantly increasing volume of comparative figures and general data of a scientific, technical and statistical nature. The graphic method permits the presentation of such figures and data with a great saving of time and also with more clearness than would otherwise be obtained. If simple and convenient standards can be found and made generally known, there will be possible a more universal use of graphic methods with a consequent gain to mankind because of the greater speed and accuracy with which complex information may be imparted and interpreted. Op. Cit., pp. 1-2.

33/ Calvin F. Schmid, "Some Comments on Roberto Bachi's 'Graphical Methods: Achievements and Challenges for the Future,'" presented at the Fortieth Session of the International Statistical Institute, Warsaw, Poland, September 1-9, 1975.