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ABSTRACT

Designed for institutional researchers, this handbook provides practical guidelines for the operation of an effective research office. Chapter I defines institutional research and describes tasks a research office may undertake, including strategic planning support, budget development, facilities planning, personnel and staffing analyses, enrollment management, program evaluation, and accountability reports. Chapter II offers guidance on selecting software and hardware, including analytical and microcomputer software, database management packages, presentation graphics, word processing software, desktop publishing packages, and equipment needs. Chapter III focuses on the presentation of research findings to management, discussing 10 fundamental principles of data presentation. the relative merits of graphs and tables, principles of tabular and graphic design, purposes and types of graphics, graphic distortions, written reports, and oral presentations. Chapter IV makes recommendations for improving the institutional research office's productivity and effectiveness, covering personal time management techniques, matching tasks to individual strengths, adequate computer resources, annual research plans, office project management systems, institutional factbooks, networks and decision support systems, and collaborative projects. Finally, chapter V discusses several approaches to increasing office staff and resources, budgeting for consultant services, utilizing faculty research associates, replacing secretaries with computers and research technicians, pursuing grant-funded staffing positions, and promoting office visibility. (WJT)

THE INSTITUTIONAL RESEARCH PRACTITIONER

A Guidebook to Effective Performance

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PREFACE

Why a "practitioners' guidebook?" We both came to institutional research from other fields (Robin is the psychologist, Craig the political scientist) and learned IR on the job. We have long felt that a need existed for a concise source of practical guidelines on how to operate an effective research office. The recent debate about whether institutional research is truly a profession with its own distinct theoretical core similar to established disciplines seemed almost irrelevant. Institutional research provides information support to improve college or university decisionmaking. It is a practical, applied craft that often uses sophisticated techniques to address a tremendous diversity of institutional information needs.

The immediate impetus for The Institutional Research Practitioner was the positive reception to Craig's paper on increasing institutional research productivity, resources, and staffing presented at the annual Association for Institutional Research Forum in Louisville in May 1990. Over 150 requests for copies of the paper were received within a month of the Forum. The requests came from experienced researchers and universities with large staffs as well as newcomers and one-person offices. It was clear that many institutional researchers were looking for ideas to help manage an increasing workload. A luncheon discussion a few weeks after the Forum led to the decision to produce this "practitioners' guidebook."

Our initial collaboration was on a county business needs assessment survey conducted in the fall of 1987 by the University of Maryland University College and Prince George's Community College, and sponsored by the Prince George's Chamber of Commerce. The study identified the professional development and employee training needs of county employers, especially small businesses, and helped guide course and program development at both institutions (Clagett and Huntington, 1988). In addition, the eight-month collaboration enhanced the relationships among the three participating organizations, a benefit as important as the survey findings. In chapter IV, we recommend collaborative projects as a means of increasing productivity.

We would like to thank David Kovel at the University of Maryland Baltimore County and Marvin Titus at the University of Maryland System Administration for their comments on Chapter II. Our purpose in preparing this guidebook was to share ideas that have proven successful at our institutions. If each reader finds at least one suggestion useful to his or her situation, we will have succeeded.

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Chapter I

DEFINING INSTITUTIONAL RESEARCH

At the 29th Annual Forum of the Association for Institutional Research in Baltimore in 1989, James Dator said that institutional researchers occupy a "very precious space between spineless administrators and mindless academicians." A less colorful description places institutional research at the center of administrative information collection, analysis, interpretation, and presentation. Institutional research provides information support to improve college and university decisionmaking. It is a practical, applied craft that often uses sophisticated techniques to investigate a wide range of institutional issues.

"Whatever Edgar Wants"

As the chief information officer of a college or university, the institutional research professional often is called upon to meet the immediate information requests of the president or top policy and planning administrator. Although many of these specific ad hoc requests cannot be foreseen, the research office can maintain data systems and reference materials facilitating quick and accurate responses. Defining institutional research as "whatever Edgar wants" captures both the necessary responsiveness and the almost unlimited reach or scope of institutional

research, which may be asked to address whatever issue or decision currently faces top management.

The President's Bodyguard

John Daniel, president of Laurentian University, suggested at the 1988 Association for Institutional Research Forum in Phoenix that institutional researchers can help presidents be better leaders by serving a bodyguard role: "A good president will have to take the risk of skating on some very thin ice. Institutional researchers should be out there skating alongside and pointing out where the ice will hold" (Daniel, 1988). Research can perform both problem identification and opportunity identification roles. While presidents differ in their leadership styles and reliance on quantitative information, a savvy institutional researcher can become an invaluable partner by providing timely and pertinent information in the format preferred by the individual campus leader.

EXAMPLES OF INSTITUTIONAL RESEARCH

Perhaps the best way to convey the scope of the contribution institutional research can make to college and university decisionmaking is to illustrate the variety of tasks the research office may undertake. Grouped under major policy areas, the examples are by no means exhaustive but merely suggestive of the

tremendous diversity of projects that institutional research offices have undertaken. The tasks a particular office completes will depend on where the office is located in the organization, current institutional direction, external influences, and other factors.

Strategic planning support. Institutional research can make a vital contribution to college planning, by preparing thorough situation analyses of the institution's internal strengths and weaknesses, and comprehensive environmental scans identifying threats and opportunities facing the institution from outside. Community needs assessment surveys may be conducted to assist the college in matching its offerings to the needs of its service population. Enrollment projections, including forecasts of the mix as well as magnitude of student enrollment, are basic planning data generated by institutional research offices at most campuses.

Budget development and other financial analyses. Environmental scanning and enrollment projections are often used in departmental and collegewide budget development. At some campuses, institutional research is responsible for sophisticated financial modeling, including forecasts of salary, fringe benefits, utilities, and other costs, as well as revenue projections from governmental sources, grants, and tuition and fees. Discipline and program unit costs may be calculated for

internal management purposes. Economic impact studies may be conducted to document the institution's financial impact on its surrounding community.

Facilities planning. In addition to enrollment projections for planning and budgeting purposes, institutional research may prepare more detailed geographic forecasts to support facilities planning, including branch campus and extension locations. The research office may be responsible for completing reports to support capital building requests, such as space eligibility forms required for state funding assistance. Programmatic forecasts may be requested for equipment procurement planning. Periodic reports of the status of the campus facilities inventory and space utilization may be prepared.

Personnel and staffing analyses. At many institutions, institutional research is called upon to provide information to guide personnel and staffing policies. As the professorate grows older in profile, retirement planning increases in importance. The research office may be asked to forecast faculty retirements, relate them to enrollment forecasts by academic area, and evaluate hiring and budget implications. Regression analysis may be used to examine faculty salary equity issues. The research office may prepare departmental staffing profiles by gender and ethnic group for use in affirmative action planning and monitoring. Data may be requested in advance of collective

bargaining negotiations to provide a common set of reference materials.

Enrollment management. The most common institutional research involves student enrollment: the magnitude, composition, and trends in discipline, departmental, program, and overall college enrollment. Headcounts, course enrollments, credit hours, and full-time equivalent (FTE) enrollments are the typical units of analysis. Demographic profiles, admission/acceptance studies, SAT score profiles, and student retention and persistence analyses are among the most common reports. Market research may be conducted to guide college recruitment strategies.

Program evaluation. Research offices are often asked to evaluate instructional programs and support services, in terms of efficient use of resources and effective production of outcomes. Curriculum needs assessments and evaluations, assessments of different instructional methods, and evaluations of grant activities are examples.

Accountability reports. Institutional research may play a central role in campus accountability reporting, especially in the assessment of educational outcomes. Studies of student academic achievement, transcript analysis, follow-up surveys of entrants, graduates, and employers of graduates, graduation rate calculations of athletes and nonathletes, and assessment of

general education outcomes (including standardized testing) are examples of research office projects that support accountability efforts. The institutional research officer is also usually heavily involved in institutional self-studies conducted for accreditation purposes.

EXTERNAL REPORTING RESPONSIBILITIES

In addition to research and analytical support of college and university policymaking and planning, institutional research is usually responsible for a substantial proportion of the institution's external reporting. The research office commonly coordinates the completion of annual federal (Integrated Postsecondary Education Data System or IPEDS) and state statistical reporting, and responds to surveys from a variety of sources. These may be annual surveys, such as comparative financial statistics for the National Association of College and University Business Officers (NACUBO), faculty salary data for the American Association of University Professors (AAUP), and institutional profile reports for accrediting agencies, or they may be one-time surveys conducted by various professional organizations, governmental task forces, other educational institutions, and private sector firms.

CONCLUSION

This introductory chapter has provided an overview of the kinds of contributions institutional research can make to college and university planning, policy formation and decisionmaking. By collecting, analyzing, interpreting, and presenting information about the institution's environment and performance, institutional research can enhance the quality of decisions guiding institutional direction and operations. The balance of The Institutional Research Practitioner is devoted to improving the practice of institutional research itself.

Chapter II

SELECTING TOOLS FOR INSTITUTIONAL RESEARCH

The medium in which the institutional researcher works is information--information about students, faculty, staff, finances, facilities, credit and noncredit programs and courses, regional and national trends, alumni, fundraising--to name just a few kinds! The extent to which the institutional research professional can readily access, manipulate, interpret, and present information on behalf of a variety of constituents will largely determine his or her value to the institution. Fortunately, there are many tools available to assist the research professional in handling information. Which tools are best for a particular office depend on the configuration of information needs, the audience for the information, and available resources.

Much of the information handled by an institutional research office is numeric. One difficulty is that the sources of the original raw data are seldom under the control of the research office. For example, in the institution's database containing information about students (the student information system or SIS), the data entry and updating may be controlled by admissions and registrations offices, and the programming by the administrative computing office. It was not uncommon in the past for institutional research to not even have read-access to the SIS to look at the data; the research office had to rely on

printouts of reports prepared by the computer center's programming staff. Now, most institutional research offices have direct read-access to the SIS files, but the problem of ensuring data integrity remains (see Gose [1989] for an excellent discussion of common sources of data corruption and suggested remedies).

The student information system, the personnel database (Human Resource System or HRS) and the financial database (Finance Resource System or FRS) are considered to be "live." That is, their data are frequently being modified and updated. For the most part, the institutional researcher will work from files of data that were extracted from the live databases on a particular census date. These "frozen" files are snapshots of the live systems as of the census date. The most common census dates are mandated by state or federal reporting authorities, such as "ten day" or "third week" official enrollment reporting dates. Additional snapshots or frozen files will be extracted for a variety of other reporting and analytical purposes. It is understood that the data change after the census date (students withdraw, courses are added, new personnel join the institution), but the frozen files are regarded as official and used for the majority of institutional research efforts. Many reports to the state and federal government are based on the fall census, so it is especially critical for the custodians of the live databases to have them complete and accurate by the freeze date. When the federal government reports that there were 9,975,064 students

enrolled in public institutions of higher education in fall 1987, the figure is based on the fall census.

Once raw data are available, either from frozen files as described above or from other sources (other campus offices, regional or national databases, surveys), the institutional researcher must be able to manipulate or "crunch" the data into meaningful information. Analysis of data may range from eyeballing tabular presentations to performing sophisticated statistical techniques. Likewise, the tools for working with data are varied.

The following sections present an overview of the kinds of computer software useful in institutional research. Although specific products are sometimes mentioned, the reader is advised that the field of software development is constantly changing. Well-known products are updated and new products become available at a bewildering rate. One should be prepared to do a lot of investigating and shopping before purchasing any software.

ANALYTICAL SOFTWARE

Statistical packages are available for both mainframe and personal computers. Although with very large data files mainframe packages may be more efficient, increasingly analysis is being done on PCs with downloaded mainframe data sets. These analytical packages may perform everything from simple descriptive statistics, such as frequency distributions, means

and medians, to more sophisticated tasks such as multiple regression, MANOVA, and discriminant and factor analyses. Factors to consider in selecting a statistical package include data management needs, data interchange capabilities, frequency of use, ease of use, documentation and support, available computer resources, the range of statistical procedures included, and efficiency and cost (Yancey and Ruddock, 1987).

The two most widely used statistical packages in institutional research are SPSS (SPSSx for the mainframe and SPSS/PC+ for the PC) and SAS, both mainframe and micro versions. Other, less widely used packages include SYSTAT (flexible, truly interactive and good for exploratory analysis, accurate and a good value), Statgraphics (great graphics, easy to learn, but limited data storage and handling and BMDP (the micro version is a minimally interactive replication of the reliable mainframe package). Although SPSS/PC+ is menu-driven, both SPSS and SAS generally take some time to learn to use. Some experienced SAS and SPSS users consider themselves "programmers" due to the coding complexities that can arise, although "true" programmers would probably argue that contention!

Generally, when using a statistical package, a command file is constructed, which is run against a set of data that is either embedded in the command file or is in a separate file. The command file directs the package to perform all the indicated manipulations and analyses, and a result file is generated. You may ask for complex data manipulations and for many different

analyses to be performed in the same run. These packages also enable the user to add titles and labels, which are helpful in deciphering a lengthy result file. Both SAS and SPSS also have report-generating procedures. SPSS/PC+ combines fast performance, a great editor, excellent data interchange capabilities, and the best documentation in the business; PC SAS has most of the tremendous data-handling capability of the mainframe version but at a cost in speed. SPSS has an advantage in that it can be purchased, while as of this writing SAS must be leased. One small advantage of SAS over SPSS is that it allows for the access of several data files at once during a run, while SPSS requires an additional step of first creating system files. People's preferences for SAS or SPSS tend to reflect which package they learned first, rather than the superiority of one to the other. Both are very powerful and valuable resources, well worth the investment in time to learn them. Whichever is chosen, a statistical software package constitutes a nearly essential tool for the institutional researcher.

MICROCOMPUTER SOFTWARE

In addition to a powerful statistical package, institutional researchers may benefit from a variety of microcomputer software including data management, spreadsheet, graphics, mapping, word processing, and desktop publishing packages. Institutional research applications of each of these types of software will be

discussed in this section. Another package useful for heavy micro users is a utilities program, with the Norton Utilities the best known. Utilities software is useful for directory and file management as well as for diagnosing and correcting disk-related problems, such as overwritten or erased files, a bad file allocation table, or a trashed root directory.

Data Management. In situations where the institutional researcher must enter or store raw data, a microcomputer database management package is valuable. Just as an information system on a mainframe computer system stores, defines interrelationships between, and retrieves data, a database application for the PC allows data to be stored, retrieved, and manipulated, with elements and their relationships predefined.

The entry and storage of survey response data is a popular use for database packages in institutional research. Many of the packages have features to allow you to create a data-entry screen, which enables you to enter raw data by tabbing between different fields on the screen that identify the variables. To facilitate entry of survey data, the data-entry screen can be constructed to look like the survey questionnaire, and each field can be defined to only allow entry of valid responses, i.e., entries outside of the choice set will not be accepted. This greatly reduces the incidence of data entry keying errors. To anyone who has ever entered series of numeric data onto flat files, the advantage of a data-entry screen will be obvious!

An important feature of database packages is their ability to upload and download files. Selected data from the database package may be extracted into a file which can be imported into a spreadsheet application or statistical package for further manipulation and analysis. Likewise, data from other sources (a mainframe tape file, a spreadsheet, etc.) can be imported into the micro database package. This data interchange capability, or ability to read, write, and transfer data stored in a variety of formats from other sources, is an essential feature for maximizing the usefulness of microcomputer applications software. Data transfer between micro packages is improving as new releases of popular applications are issued. For example, the popular spreadsheet program Lotus 1-2-3 release 3 provides full access to dBASE files from within the spreadsheet without having to convert the dBASE files to 1-2-3 worksheet files. You can add new records to the dBASE file or even create new dBASE files from within your spreadsheet. All of your software packages should have interface capability.

The most popular database management package in institutional research is probably Ashton-Tate's dBASE series, although Microrim's R:base and Borland's Paradox have their adherents. Database packages can be somewhat complicated to use compared to other micro applications; however, newer releases are often menu-driven facilitating use by nonprogrammers. These packages tend to take up a lot of space on your hard disk, so you should carefully consider your needs before purchase.

Spreadsheets. Spreadsheet applications are probably the most common type of PC package used in institutional research. Spreadsheets are similar to financial ledger sheets, ruled into rows and columns. The rows and columns form cells into which a number, formula, or label may be stored. Spreadsheets are useful for basic tasks such as storing and manipulating small data sets, performing some simple descriptive statistics, and presenting data in tabular form. Most also have graphic capabilities. Data manipulation may involve physical movement (adding, deleting, or moving columns and rows of data) or performing mathematical operations.

The power of spreadsheet applications comes from the use of mathematical formulas. The formula referring to one set of cell entries may be copied so that it applies to another set. Very elaborate models may be constructed in this way, making spreadsheets ideal for "what-if" investigations. Model assumptions can be varied and the impact on various dependent variables immediately discerned. For example, spreadsheets are often used for enrollment projections and financial planning models.

Complex command sequences can be automated by the use of macros. A macro is a sequence of recorded keystrokes or commands that the software executes automatically. Macros are stored with the spreadsheet in which they are created, so you can have different macros for each spreadsheet. Sophisticated use of macros enables construction of applications that can be used by

others with very little knowledge of the parent program.

The integrated graphics capability of most spreadsheets is useful during analysis. Generally, line, bar, X-Y, pie, area, and high-low graphs are available. Viewing these while you work with the data in the spreadsheet can highlight relationships and suggest further analysis. Some spreadsheet packages, such as Borland's Quattro Pro, offer high quality, flexible graphics useful for presentation purposes as well.

Lotus 1-2-3 is by far the most well-known spreadsheet application, although several other powerful packages, such as Quattro and Microsoft's Excel, are gaining favor. Newer packages employ the mouse-driven graphic interface made popular by the Apple Macintosh. One advantage of using Lotus is that because so many people are familiar with it, it is easy to get help. Again, however, with high quality products the advantages of one over another tend to change with each update, and personal preferences and prior experience often will be decisive in making a selection.

Presentation Graphics. Although some of the spreadsheet packages have graphics capabilities, more refined graphics may be desired for final documents and presentations, and so a more sophisticated graphics package may be warranted. With dedicated graphics packages, data manipulations are limited, but the graphics are more powerful and versatile, allowing for more text, labels, symbols, font choices, graph types, and overall design

flexibility. Packages such as Ashton-Tate's Applause II come with a "gallery" of clip-art images that can be used as pictures or as backgrounds to enhance presentation graphics. Perhaps more importantly, the final product is generally of a higher quality than with some of the spreadsheet graphics, although the newer spreadsheet releases are closing this gap.

Packages such as Harvard Graphics and Applause II can generate a variety of high quality graph types on paper, overhead transparencies, or slides. Being menu-driven, these packages are easy to use and high-quality products can be produced very quickly, even by a beginner. As we explain in the next chapter, however, the ease with which graphics can be created on these packages is a potential danger to the unsophisticated user. Knowing when a graph should be used, deciding what type of graph is appropriate, and creating graphs that do not distort the data, are acquired skills.

When geographic analysis is important, a special type of graphics package is called for. Mapping or geographic information system software, such as Strategic Mapping's Atlas series, enable the institutional researcher to display a variety of data by census tract, zip code, minor civil divisions, districts, counties, states, nations, or other geographic units, depending on the cartographic boundary files available. Editors allow the user to define other boundaries as well. U.S. Census and other data associated with geographic units are available on diskettes, enabling the user to easily display demographic

variations by geographic location, to support an environmental scan, for example. The institutional researcher can also create maps of college-generated data. For example, a college might map its enrollment yield rates by state or zip code to help target marketing efforts, suggest transportation needs, or identify sites for extension operations.

Word Processing. Word processing packages allow you to type, edit, format, and print textual information. The word processor is to the typewriter what the spreadsheet is to the calculator! Many word processors include spell checkers, dictionaries, and thesauruses, making writing less cumbersome. Drafts can easily be revised, avoiding needless retyping.

This document was created using the most popular word processing software, WordPerfect. We were able to type our thoughts, go back and delete lines that made little sense, add lines that we thought made more sense, move blocks of text around to improve text sequence, adjust margins and spacing, share chapters on floppy disk, and produce a finished product, all with a minimal amount of keyboarding. This process on a typewriter would have taken much more time or secretarial help, as successive versions were typed and retyped, and produced a lot more frustration as we tried to work from the most recent version, which might still be in the typewriter. Even if you prefer secretarial help in preparing reports, a word processor will make the process a lot easier on both of you.

Newer releases of the more popular word processing packages include some desktop publishing features, and facilitate the importation of tables and graphics from spreadsheets and other packages.

Desktop Publishing. A desktop publishing package picks up where most word processors leave off, by providing a much greater range of text enhancement, type composition, and page layout capabilities. Typeset-quality documents can be produced without the traditional method of pasting up galleys and artwork on a mechanical layout. Pictures and drawings from graphics programs and image scanners can be added, as can tables from spreadsheets and databases. For example, a publication about recent graduates might be identified by a symbol of a mortarboard, and data tables or graphs from a follow-up survey might be interspersed with columns of text. Text and graphics can be composed interactively on the screen and viewed before you print them. Stylesheets can be saved for newsletters and other documents that you plan to issue more than once, so the design need be created only once. For example, once you decide on a "look" for a research brief, you need only load your wordprocessing file into the publisher and the previously saved stylesheet file instructs the publisher how to format the document. Desktop publishing packages are generally not word processors, though some text manipulation is possible. Usually, a word-processing document is edited and proofed and then loaded into the publisher.

Desktop publishing applications in institutional research might be limited to reports prepared for very special audiences (governing boards, legislators) or for producing survey questionnaires. Desktop packages allow you to create very polished and professional-looking products, which will catch the eye of the audience and reflect well on the institution. Because of the increasing sophistication of word processing software, however, a separate desktop publishing package may be considered more a luxury than a necessity for the institutional researcher.

EQUIPMENT

Some mention should be given to the kinds of equipment one needs to take advantage of these software packages. For the most part, this chapter has been written from the perspective of an IBM or IBM-clone user. The particular packages discussed may not have versions for Apple computers, and software written exclusively for Apple machines has not been mentioned. We have found that in spite of Apple's strengths in several areas, cost and lack of compatibility with existing systems keep it a far second in popularity in institutional research offices.

As the IBM world moves to emulate the features that make the Apple computers so attractive, more and more applications are being designed with a graphic interface for point-and-click mouse use. The mouse allows you to freely move around the screen and point to and select menu options or other features. It is

particularly useful for graphing and desktop publishing.

These days it is very unusual to find anyone still running applications from floppy disks. You will need a system with a hard drive large enough to handle the kinds of applications you plan to use. Storage requirements vary from package to package, and should be considered when purchasing both a system and the software. Memory is the next consideration, as some of the more sophisticated packages take a lot of memory to run.

You will need access to a printer from your PC. A laser printer produces high-quality output quickly and quietly. There is little point in having some of the top-of-the-line graphics printers or desktop publishers if you don't have a printer that can take advantage of them. A color plotter is also useful for producing overhead transparencies for presentation purposes.

Another useful peripheral to have is a modem. A modem allows you to connect your PC to other computer systems through telephone lines. You could have direct communications to on-line library catalogs, national databases, or communications networks such as Bitnet or Internet. These kinds of connections to the outside world are not only valuable, but a lot of fun!

CONCLUSION

In deciding which kinds of software you need and which particular packages you want, one of the most important resources to take advantage of is colleagues in other research offices.

Find out what packages others are currently using, how well they are doing the job, and how difficult they were to learn. Also speak with the people in your institution's computing offices. They are generally eager to discuss new software; in fact, the hard part is often getting them to stop talking about it! Finally, visit your library, a bookstore or newsstand. There is a plethora of magazines aimed at the PC user, as well as numerous books, manuals, and guides.

Particular attention should be given to how difficult packages are to learn. Assessing the learning curve is important in making decisions to upgrade to a new version of an existing package, as well as in initial purchases. While applications software revolutionized institutional research, providing the greatest single leap in office productivity in institutional research's short history, researchers must avoid becoming captive to an obsession with the latest, state-of-the-art tools. You can easily devote excessive office time to evaluating new software and discovering bugs in the newest releases. In reaching decisions to adopt a new package or upgrade an existing one, the impact on office productivity should be carefully considered. In general, such transitions should be made only when the new product offers improvements that will have a substantial return on office efficiency. However, once you adopt new packages and become accustomed to each new feature of these valuable and evolving tools, you won't know how you got along without them!

Chapter III

PRESENTING RESEARCH FINDINGS TO MANAGEMENT

It is the hope and assumption of most institutional researchers that their work will inform decisionmakers, leading to better decisions. But this outcome is unlikely if the data secrets remain buried in computer files or "green bar" printouts. Transforming data into useful information is both an art and a science--and an essential skill for the effective institutional researcher.

In part, the challenge is to present research results in formats and at a level of sophistication accessible to top management. Few top administrators can afford the luxury of studying in detail the numerous statistical reports generated by a productive institutional research office. Only a few findings have the chance to influence institutional decisions. The research professional must devise ways of improving the odds that study insights and findings will be assimilated into the decisionmakers' frame of reference.

FUNDAMENTAL PRINCIPLES OF DATA PRESENTATION

The basic problem was stated by William Playfair in 1801:

> For no study is less alluring or more dry and tedious than statistics, unless the mind and imagination are set to work or that the person studying is particularly interested in the subject; which is seldom the case with young men in any rank in life. (Quoted in Fienberg, 1979, p. 165).

Since this is probably still the case nearly two centuries later, institutional researchers need to know how to convey statistical information to those not statistically inclined. Statistical data may be presented in text, tables, or graphs. Each method has its advantages and disadvantages, which will be discussed below. First, however, we present ten fundamental principles of data presentation that can contribute to more effective institutional research:

Know what information is needed. The most fundamental principle of all is to provide the decisionmakers with the data they need. Ideally, the institutional research director should be "in the loop", preferably on the president's cabinet, college planning council, or equivalent. If this isn't possible, ensure through other means that you are kept informed so that project priorities and research designs are chosen to maximize their utility to decisionmakers. Note that this means more than being responsive to requests; decisionmakers may not know enough to ask for data that may be useful to them. The effectiveness of, and respect given, institutional research increases when it provides information unasked for but pertinent to the task at hand.

Know when the information is needed. Timing isn't everything but it's close. Your analysis won't have much influence on a decision that was made yesterday. It's best to be proactive and have the information prepared before it's needed, and then time

its presentation to coincide with the beginning of deliberations of decisionmakers. However, since it's impossible to anticipate all decisionmakers' needs, maintaining a readily-accessible database for quick responses to late-breaking requests is also necessary. This would include an office library of reference materials as well as computer access to student and other files.

Match format to analytical sophistication and learning preferences of recipients. As Meredith (1989) has argued, "Use the least sophisticated tool to make your case. Don't get wrapped up in procedures when results and trends are the most important product." Presidents and trustees may not accept your findings if they get overwhelmed by your statistical wizardry. While you must employ the most appropriate tool based on your judgment as a research professional, you must also present the findings in ways accessible to your audience. If you lose people in long discussions of your methodology, the valuable insights you may have discovered may be lost as well.

Focus on one or two research questions or conclusions. While particularly applicable to oral presentations, this is a good guideline for written reports as well. A series of brief reports, each devoted to one or two issues, will often be more effective than one large, comprehensive study. At times, however, a report will necessarily be lengthy. This leads to the next principle:

Include a brief summary. An executive summary is not only a courtesy to your reader, but may mean the difference between your study being read or not being read. A large report lacking a summary may not be read at all; with an overview up front to spark interest, it may be read in full. At the very least, the reader will learn the major findings from reading the summary.

Eschew obfuscation! To avoid confusing your audience, keep your language as simple and direct as possible. You may have no choice but to use sophisticated, even arcane, techniques, if the task calls for them, but you need to discuss them and their results in common terms. For most applications, you will want to avoid the jargon of your discipline. Reread your Strunk and White, and remember Thomas Jefferson's words: "The most valuable of all talents is that of never using two words when one will do."

Use graphics sparingly and correctly. The selective use of graphics can be a great communications aid, but they must be used with discrimination and precision. The ease of graphing provided by microcomputer software has caused the proliferation of graphs in institutional research applications, often compounding the problem of information overload and reducing the effectiveness of communication. The untutored can easily create misleading graphics, and even the skilled often use too many of them.

Integrate tables and graphics into text or presentation. Avoid having page after page of tables or graphs with no text, or data separated from text so that the reader constantly has to interrupt his or her flow to "See table X" located on another page, or worse still, in an appendix. Tufte (1983, p.181) argues:

> Data graphics are paragraphs about data and should be treated as such....Imagine if graphics were replaced by paragraphs of words and those paragraphs scattered over the pages out of sequence with the rest of the text--that is how graphical and tabular information is now treated in the layout of many published pages.

While in some cases extensive appendices of data may be appropriate, pull out key data referred to in the text and place these data abstracts directly in the textual flow. This will require selectivity or what Norris (1983) has called "triage and the art of institutional research;" the point is that unessential supporting data should be omitted from reports developed for wide distribution.

Consider infrequent use of analogies, mnemonics, or other verbal aids. The key word is infrequent; a reputation for excessive cuteness will ruin credibility. However, the occasional use of catchy phrases can be effective. For example, "it takes two 40-year-olds to equal one 18-year-old" will get laughs but also make the point that FTEs will fall with a one-to-one replacement of declining high school graduates with older "returning adults." The catchy phrase works where a table of average credit hour loads by age cohort may not.

Repeat major findings in subsequent communications when opportune. The active life of much institutional research in decisionmakers' minds can be very short--an answer to an immediate question is often quickly forgotten. This is unfortunate; the insights of solid research could often continue to be useful guides to decisionmaking. Look for opportunities to restate research findings, especially when they go against the conventional wisdom. Use previous findings when pertinent to new studies and build institutional knowledge. In your monthly activity reports, instead of just listing projects completed, include a sentence or two summarizing what was learned.

PRESENTING DATA: TABLES OR GRAPHS?

Data may be discussed in text, presented in tables, or displayed in graphs. Text allows for interpretation, and may be most accessible to the broad audience. Tables are best when exact numerical values need to be communicated, and when many localized comparisons are to be made. Graphs can communicate trends powerfully, and reveal relationships in the data that would remain hidden in tables. William Playfair, a pioneer in graphical design, wrote in 1786:

> Information, that is imperfectly acquired, is generally as imperfectly retained; and a man who has carefully investigated a printed table, finds, when done, that he has only a very faint and partial idea of what he has read; and that like a figure imprinted on sand, is soon totally erased and defaced....Charts...while they give a simple and distinct idea...are as near perfect accuracy as is any way useful. On inspecting any one

> of these charts attentively, a sufficiently distinct impression will be made, to remain unimpaired for a considerable time, and the idea which does remain will be simple and concrete. (Quoted in Tufte, p. 32.)

The use of graphs in institutional research has expanded rapidly in the recent past, spurred on by user-friendly software. Despite claims by vendors that the use of computer graphics improves decision speed and quality over traditional methods of data display, the available evidence is more mixed than supportive; indeed, in contrast to Playfair's assertions, research suggests graphs may be no better than tables as an information presentation method. In a comprehensive review of the literature, including 116 references, DeSanctis (1984) found that features that make a graph visually attractive, such as color, design complexity, and realism, may detract from accurate comprehension. The ability to use graphs effectively varies across individuals, so an overreliance on graphical displays may inhibit understanding and effective communication. Examination of studies directly comparing tables and graphs on several dependent variables, such as interpretation speed and accuracy, information recall, and decision-making confidence, found tables more effective than graphs more often than the reverse (DeSanctis, 1984, p. 475). Her conclusion, that "support for the superiority of graphics over tables as a presentation mode is extremely weak," should give pause to graphics-happy institutional researchers.

PRINCIPLES OF TABULAR DESIGN

Tables will continue to be the most common mode of data display in institutional research because actual data values will continue to be wanted by decisionmakers. Tables are compact and exact but their abstractness requires an educated reader. As MacDonald-Ross (1977) has pointed out, "Even quite sophisticated people need time to get the main points from a table (often much more time than they would need with a bar chart or pictorial chart) and less educated people often cannot read tables at all" (pp. 378-379). Proper table design can ease the difficulty. Adherence to the following principles of tabular design (developed from Walker and Durost [1936], and Ehrenberg, cited in MacDonald-Ross [1977]) can improve data communication by tables:

1. Have a clear purpose for presenting the data and design the table to make your point.

2. Ensure through adequate labeling, including title, headings, units, and sources, that the table is self-explanatory and can stand alone if removed from its context.

3. Provide row and/or column averages for reference points.

4. Use columns for most important comparisons.

5. Rank order rows and columns by size of numbers, not alphabetical order of labels.

6. Set columns and rows compactly--do not artificially space out to fill the page. Space can be used to distinguish blocks of related data.

7. Round numbers to two significant digits to facilitate mental arithmetic.

The last principle is routinely violated in institutional research reports, but is worthy of consideration. Rounding errors are usually trivial in effect, and the positive advantage of eliminating the extra digits is that "we can see, manipulate, and communicate two-digit numbers better" (MacDonald-Ross, p. 379).

PRINCIPLES OF GRAPHIC DESIGN

Simply because user-friendly software has made creating attractive graphs an easy task does not imply that creating effective graphs is easy. As Schmid and Schmid (1979) state, "no amount of sophistication in computer technology alone is a substitute for genuine understanding and expertise in the theory and practice of graphic presentation" (p. 12). They assert the widespread existence of "graphic illiteracy" (p. 11):

> The preparation of statistical charts is not a perfunctory, mechanical procedure; rather, it involves conceptual logic and other basic principles....An effectively designed chart is tantamount to a visual statement, not infrequently equivalent to many paragraphs or even many pages of written words....Although statistical charts are often a more powerful and significant vehicle of communication than words, there is a strange tolerance for poorly constructed charts. Paradoxically, the reader who is outraged by an ungrammatical sentence, an ambiguous statement, or even misplaced punctuation marks may be quite tolerant or indifferent to crudely designed, idiosyncratic, inappropriate, or confusing charts. This situation is essentially reflective of the graphic illiteracy not only of the reader but also of those responsible for the preparation of poorly designed and executed charts.

MacDonald-Ross concurred, saying that "the researcher will soon discover that most practitioners are more or less incompetent!" (p. 403). Incompetence and intentional deception produce graphics that "lie," so Tufte (1983, p. 77) developed six principles of graphical integrity to ensure that graphics tell the truth about the data:

> 1. The representation of numbers, as physically measured on the surface of the graphic itself, should be directly proportional to the numerical quantities represented.
>
> 2. Clear, detailed, and thorough labeling should be used to defeat graphical distortion and ambiguity. Write out explanations of the data on the graphic itself. Label important events in the data.
>
> 3. Show data variation, not design variation.
>
> 4. In time-series displays of money, deflated and standardized units of monetary measurement are nearly always better than nominal units.
>
> 5. The number of information-carrying (variable) dimensions depicted should not exceed the number of dimensions in the data.
>
> 6. Graphics must not quote data out of context.

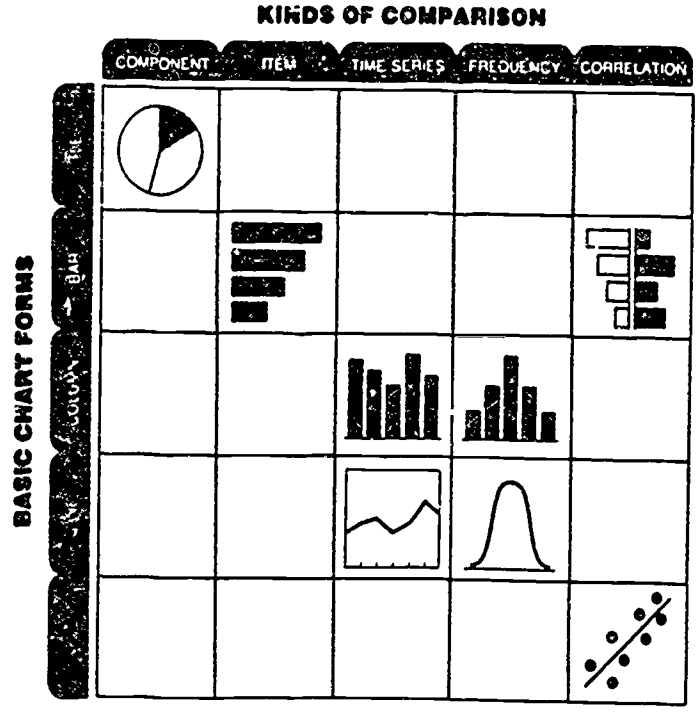
Tufte's book should be read by anyone interested in graphical displays of data, for the enjoyment as well as the enlightenment it provides. In addition to not distorting the data, graphical excellence for Tufte consists of communicating complex, usually multivariate, ideas with clarity, precision, and efficiency, summed up in his principle (p. 51):

> Graphical excellence is that which gives to the viewer the greatest number of ideas in the shortest time with the least ink in the smallest space.

Tufte's idea, that most of a graphic's ink should vary in response to data variation, underlies his theory of data graphics and leads to some experimental designs that, at the least, would take some getting used to. Until they are included in popular graphics software packages, most institutional researchers will continue to use the traditional formats.

Graph Purposes, Types, and Effectiveness

Graphics for presentation purposes usually have one of the following purposes: to show component proportions, item magnitudes, trends or time series, frequency distributions of items over ranges, or relationships between variables. (Graphics can also be used for analysis; see Anscombe [1973] and Tukey [1977].) The traditional graph types include pie, bar, column, line, and dot, and the choice of each is dependent on the kind of comparison you want to show:



While your purpose should determine the type of graph you select, research and experience suggest some types are more effective than others:

Horizontal bar charts. Several authors, including MacDonald-Ross (p. 401) and Zelazny (p. 26), argue that horizontal bars deserve broader usage due to their versatility and effectiveness, especially for showing item comparisons. Deviations, correlations, and the mix of two components can also be shown with horizontal bars using both sides of the vertical axis.

Line and column charts. Effective, reliable workhorses for showing time series and frequency distributions.

Pie charts. The ubiquitous pie chart is overused but appropriate when used in moderation for showing composition or component parts of a whole at a single point in time. Most people have difficulty making fine distinctions between angles; pies with more than four segments are especially problematic. Tufte is emphatic in his distaste for pie charts: "A table is nearly always better than a dumb pie chart; the only worse design than a pie chart is several of them, for then the viewer is asked to compare quantities located in spatial disarray both within and between pies" (p. 178). We agree that multiple pies with multiple slices are to be avoided, but the occasional use of individual pies with four or fewer segments can be effective.

Segmented bars and graphs. Segmented or stacked bar graphs attempt to show both magnitude and composition. In certain

specific instances, for example when one segment is largely responsible for the overall change in magnitude, segmented forms can be effective. However, because they lose the common reference line and make comparisons difficult among all but the bottom segments, they should generally be avoided. Segmented area graphs are even more difficult to comprehend.

Three-dimensional graphs. While intriguing to look at, three-dimensional graphs contain unnecessary complexity and are often ambiguously perceived. When they vary in more dimensions than the data, three-dimensional graphs are invariably misleading, as they are rarely constructed so that the change in volume is proportional to the change in the data. MacDonald-Ross's review of the literature on visual perception led him to state that "segmented graphs and three-dimensional forms (that represent quantity by volume) should never be used" (p. 401).

Chloropleth maps. Chloropleth maps show geographic areas of equal value on the variable investigated by the same color, hatching, or shading. They are useful for geographic analysis, where location is paramount, but they can be misleading since they equate the visual importance of a geographic area with the value of the variable being displayed, or as Tufte puts it, "Our visual impression of the data is entangled with the circumstance of geographic boundaries, shapes, and areas" (p. 20).

Pictorial charts. Pictorial charts use icons or symbols associated with the subject matter to show quantity and are thus less abstract than other charts and more accessible to the

general reader. The only acceptable pictorial chart is that which repeats identical symbols of the same size to reflect quantities. Those that change width as well as height to maintain pictorial proportions will distort the data, unless carefully designed to reflect the data change by area, a difficult and infrequent practice. Tufte shows several examples of how the "confounding of design variation with data variation" leads to "ambiguity and deception, for the eye may mix up changes in the design with changes in the data" (p. 61). Huff (1954) and Spear (1969) also point out intended and innocent examples of misleading pictographs. Two-dimensional pictographs of objects generally understood as having three dimensions further compound the distortion; a true doubling of the data in question shown by a picture twice as high may be conveyed visually (since the mind understands the image as three-dimensional) as an increase by a factor of eight. In general, pictorial charts, though popular in the mass media, should not be used in institutional research applications.

Inadvertent and Intentional Graphical Distortions

Selecting the appropriate graphical type is not all there is to proper charting. Misleading graphics may be created on purpose by the clever or unwittingly by the uninformed. Three common distortions occurring in line and column charts are truncated or broken axis scales, "flexible" scales or grids, and multiscale graphs.

Truncated or broken axis scales. Graphs with arithmetic scales should almost always begin at the zero base line and not have any breaks in order to show the true variation in the data. By showing only a fraction of the scale, through a broken scale or starting at a nonzero origin, data changes may be greatly exaggerated. Clearly marking the scale break is not a sufficient remedy, since what is remembered is the distorted impression, not the broken scale. The only exception is in an analysis of marginal changes, and only if the graph is so labeled and this context is clearly understood by the audience.

Flexible scales or grids. By expanding or contracting the horizontal or vertical axis, or both, the graph designer can visually alter the slope of a trend line. Changing the proportion between the ordinate and the abscissa is a simple way of manipulating the visual impression of data change. The best defense is an educated viewer who takes note of the scaling units.

Multiscale graphs. Beware of charts using two or more scales--it is very easy to adjust the scales to make one trend appear greater in amount or slope and thus more important than another trend. The use of standardized units may obviate this problem, at a cost of adding abstractness to the presentation.

Finally, a word about color. Color may detract from effective communication if used in an unthinking manner. If a chart does not communicate well in black and white, color is not going to help (Zelazny, p. 80). Color should be used for a

purpose, not as decoration. For example, color can be used to highlight the key part of a graph, to identify a recurring theme in a series of charts, or to distinguish actual from projected data.

Underlying this discussion of graphical design is a necessary commitment to integrity in data presentation. The institutional researcher usually has much discretion in determining how data are presented, being acknowledged as the expert in this area. Darrell Huff (1954, p. 120) made the point well:

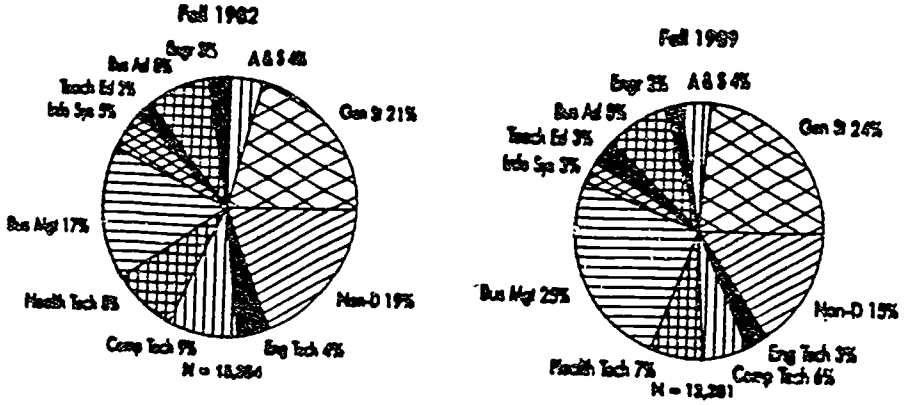
> The fact is that, despite its mathematical base, statistics is as much an art as it is a science. A great many manipulations and even distortions are possible within the bounds of propriety. Often the statistician must choose among methods, a subjective process, and find the one that he will use to represent the facts. In commercial practice he is about as unlikely to select an unfavorable method as a copywriter is to call his sponsor's product flimsy and cheap when he might as well say light and economical.

Proper graph construction is an ethical as well as statistical and artistic exercise. "Visual presentations have a more lasting impression than the data they represent" (Spear, 1969, p. 68). Institutional researchers should strive to "tell the truth about the data" by being aware of potential distortions and by applying Tufte's principles of graphical integrity.

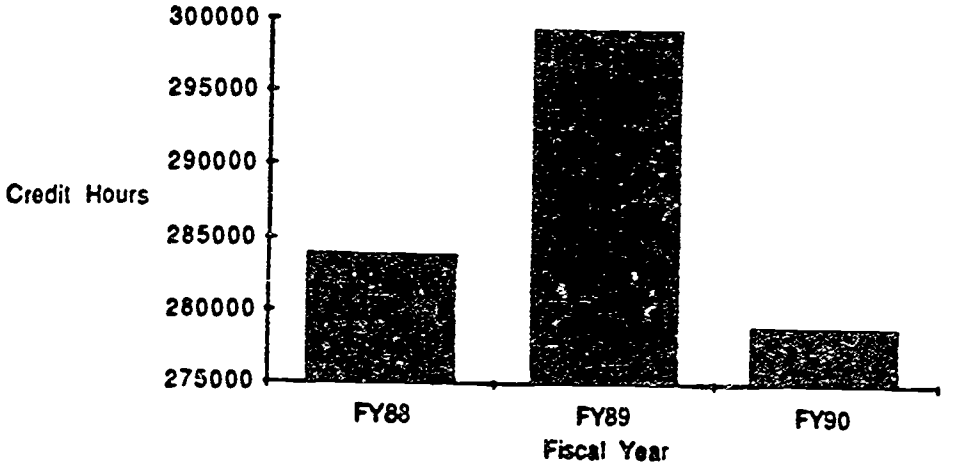
Three common examples of confusing, misleading, or distorted graphs are shown on the opposite page: multiple pies with multiple slices, a truncated scale, and a misleading three-dimensional pictograph.

AVOID THESE GRAPH GAFFES!

CHANGING CURRICULUM CHOICES

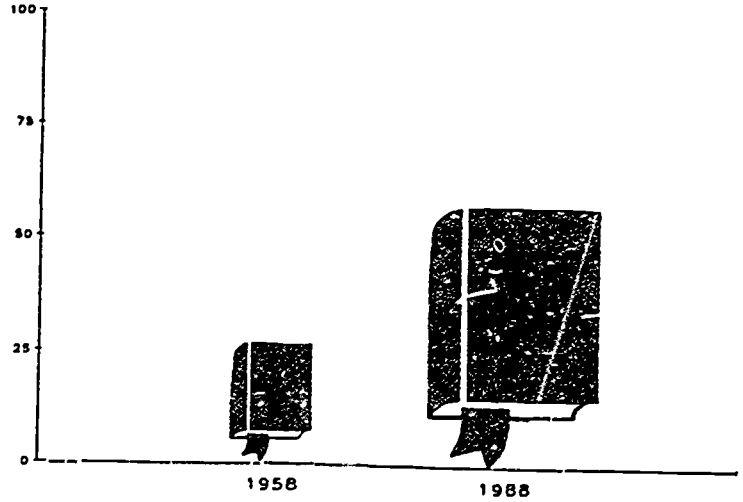


CREDIT HOURS BUDGET COMPARED TO 2 YEAR'S ACTUAL



BOUND VOLUMES, CAMPUS LIBRARY

(Thousands)



In addition to the selection and proper construction of individual graphs, the mix of graphs used in a report or presentation should be carefully considered. Page after page, slide after slide, of the same graph type should generally be avoided; the monotony can destroy effective communication. (An exception is a short series of similar data displays where trend or profile comparisons across graphs are desired. For related graphs in such a series, use the same format, typestyle, orientation and scale on all graphs, so the viewer's focus is on the data variation and not design variation.) In most applications, the fundamental principle that graphs should be used sparingly for emphasis or to reveal relationships holds. When many graphs are to be used, a variety should be used to aid audience attention, if the data and purpose allow. Zelazny (1985, p. 26) recommends a mix of 50 percent column and line graphs, 25 percent horizontal bars, 10 percent dot or scatterplot, 5 percent pie charts, with the remainder combination graphs. This recommended mix varies from common practice, where pies are most frequent and horizontal bars underused.

WRITTEN REPORTS

In most instances, the fundamental principles discussed at the beginning of the chapter apply to the preparation of written reports. Short, concise research briefs focussed on one or two research questions are usually more effective than long,

comprehensive treatises when trying to influence busy decisionmakers. The standard format of executive summary, introduction and background, method and limitations, findings, conclusions, and appendices is appropriate for more formal reports, especially if they concern highly visible or controversial policy decisions. Technical appendices may lend credibility and be read by an unseen audience of advisors to top management.

Writing is an art and skill that improves with practice. Make a habit of writing up short technical memos or research briefs to capture the insights of small data requests. A few words of interpretation can avoid misuse of data by others. As they accumulate, you build an office reference library helpful in responding to future requests.

Finally, consider preparing reports for publication in the professional literature. As Ruggiero, et al., (1985) argued, "If we don't write--more and better--to each other, many of us are likely to remain number crunchers and file makers--discovering, but failing to interpret and communicate."

ORAL PRESENTATIONS

The principles of good speech communication apply to the oral presentation of data and research findings. The presentation should have a structure, starting with an introduction to catch attention, orient the audience to the

subject, and establish rapport. The purpose of the presentation should be clearly established. The body of the speech should contain transitional statements to promote a smooth, logical flow. The presentation should conclude with a brief summary and a strong final point. To overcome shyness or reticence, focus on your message and think of public speaking as simply an enlarged conversation. Vary your pitch and intensity to emphasize what is important. Use a few visual aids for emphasis, not a lot as a crutch. Come early to check any equipment you plan to use so as to avoid technical problems. Basically, know your material, be prepared, and apply the fundamental principles!

CONCLUSION

How research findings are presented to management largely determines how effective they are in influencing decisionmaking. Institutional researchers should carefully evaluate how well they perform the data-to-information transformation. It is hoped that the ideas in this chapter can serve to stimulate such self-examination, with the goal of improving the effectiveness of the institutional research practitioner.

Chapter IV

MAXIMIZING OFFICE PRODUCTIVITY

The year was 1979. The members of the Maryland Community College Research Group were so moved by a pressing institutional research issue that they published a rare position paper. Its title? The Strangulation of Institutional Researchers: Increased Regulation and Reporting. The increasing demands of required external reporting threatened to preclude institutional research support of college decisionmaking. One college estimated that over 16,000 staff hours were required annually to complete forms for external agencies, an amount equal to eight full-time employees working all year on just those reports. The paper argued that the very role of institutional research was being subverted or redefined in adverse ways.

Eleven years after the strangulation paper, external demands for information have not slackened, and internal needs for information have increased at many campuses, in keeping with strategic planning needs and accountability mandates. An additional irony increasing the institutional research workload is captured by the cartoon line "I'm so pleased with the way you handled that lousy, thankless job I gave you, Craig, that I'm going to give you another one." The reward for good work is usually more work!

How can institutional research cope with its increasing workload? Three choices exist: work more hours, increase productivity, or increase staff and resources. Assuming the first option is least preferred, this chapter and the one following will present techniques to improve office productivity and strategies to increase staff and resources. The goal is to enable the institutional researcher to provide meaningful support for institutional planning, policy formation, and decisionmaking, by creating the requisite resources in time and personnel.

We argue in the next chapter that most offices of institutional research could profitably use additional staff. However, before you can legitimately and persuasively argue the case for more staffing, you must demonstrate that you are effectively using the resources at hand. In this chapter, we outline several suggestions for improving institutional research productivity and effectiveness.

Personal Time Management Techniques

Someone once said time is nature's way of keeping everything from happening at once, but in institutional research you sometimes wonder. The one-person institutional research office faces the same problem as any busy professional: making the most effective use of his or her limited time. Personal time management techniques can provide some guidance. The four steps

of triage, delegation, setting limits, and prioritizing can be summarized in question format as follows:

1. **What will happen if I don't do this at all?** The first question is the basic yes/no, to do the job or not. A respected research office will get more requests than it can possibly handle and so will by necessity have to turn some down. Accept those that will serve the needs of your governing board and president's staff, or please those in a position to help you. Be reluctant to accept others, regardless how meritorious the idea or friendly the source. Generally avoid projects serving narrow interests--do you really have the time to help yet another faculty member get their dissertation done? Practice project triage so you can devote adequate time to the really important ones.

2. **Is there someone else who can do this well enough?** It is important to maintain quality control and ensure accurate data support to top management, but an overextended institutional research professional cannot do it all. If a project is worth doing but your personal time is committed to other, higher priority projects, delegate the work to someone who can do an acceptable job. This is often difficult; you have

built your professional reputation and office credibility on your own efforts and delegation may mean a job done differently than you would have done it. But if you maintain sufficient oversight of the institutional research "temporary" you can get the work done in a satisfactory if not optimal manner. (The use of temporary research associates is discussed in the next chapter.)

3. **How much time is this task worth?** Analytical pathways can be unending, as each new insight can lead to several other areas to explore. Bringing really interesting research projects to closure requires discipline; usually, however, the pressure of other tasks makes the effort easier. It is helpful to set limits at the outset and stick to a timetable for project completion--an office project management system can help.

4. **Is this the best use of my time now?** Once you know what projects you should personally work on, and have established limits by defining the project parameters, you still need to decide what task should demand your attention now. **Prioritize** your tasks according to deadline and importance. Don't procrastinate on the important projects by doing the easy ones first; if

you do, you'll end up doing the really visible and important work in a rush--not an effective approach.

Matching Tasks to Individual Strengths

As soon as the office grows beyond one person, the importance of matching job assignments with the specific skills of individual employees surfaces. This means more than simply allocating work according to established job descriptions. People differ in how they acquire information, how they reach decisions, how they prefer to interact with others. Awareness of preferred work styles may aid in producing more effective task assignments. Some offices may benefit from "job mapping" exercises or workshops based on psychological tests such as the Myers-Briggs Type Indicator or Herrmann Brain Dominance Instrument. Giving work assignments that people enjoy can improve morale, productivity, and work quality. However, care must be taken that specialization and division of labor do not create indispensible employees whose absence would totally halt work flow. In addition, employees should periodically be given challenging assignments that push them to expand their skills; staff professional development should be an office goal.

A Microcomputer on Every Desk

The greatest boon to office productivity in recent memory, the microcomputer has applications in almost every institutional research task, as discussed in Chapter II. Indispensable are spreadsheet, statistical analysis, and word processing software, with database management, graphics, and mapping packages very useful. More and more offices are adding desktop publishing to enhance the appearance of questionnaires and office publications. Laser printers are now the standard, with plotters for preparing color overheads and presentation software for automated shows and slide preparation becoming more popular. Machines are commonly connected to the mainframe and increasingly linked in networks. Micros are ubiquitous due to their tremendous, diverse utility; the point we want to emphasize here is that every staff member should have his or her own machine. "A micro on every desk" is an investment in office productivity matched by few others.

Annual Research Plan

Preparation of an annual research plan at the beginning of each fiscal year serves several useful purposes. Planned activities can be posted under three headings: required external reporting, routine institutional reporting, and priority research projects. Use a matrix, with these three headings as columns (plus a fourth column for estimated staff hours needed) and

calendar months as the rows. Using federal and state reporting schedules, post required external reports by due date on the research plan calendar. Next, post all anticipated, recurring institutional reports by month in the second column. Post the estimated work hours, classified as director/analyst/technician level, in the fourth column for all external and routine internal reports entered. The calendar will now suggest what months have time available for priority research projects, and approximately how much staff time is available. Use this information in discussions with your president and deans; by showing that the time available for substantial research efforts is limited, you can make the selection of priority projects a visible choice--highlighting the fact that perhaps many meritorious projects cannot be done given current resources. You also gain consensus that the projects you do accept are those of greatest importance to the institution. Post the agreed-upon priority projects by month in the third column to complete your annual research plan.

In addition to using the annual research plan as a negotiating and educational tool with top management, you can elaborate upon it for office planning purposes. Office goals and objectives for the year can be developed concurrently, and all posted reports and projects can be entered into an office project management system for monitoring productivity throughout the year.

Office Project Management Systems

Keeping track of the multitude of projects underway concurrently in most institutional research shops is greatly facilitated by implementation of an office project management system. A busy shop may complete over 100 projects annually, most with established due dates and many containing multiple stages. Even a one-person shop can benefit from a computerized system for monitoring project progress, while such a system is especially valuable to larger offices. You do not, however, need specific project management software. Such software is intended and most appropriate for large, long-term projects with many interrelated subunits, where time and cost monitoring are essential. The need in the typical institutional research office is different. Rather than detailed tracking of one or a few individual projects, the need is for monitoring the status of dozens of projects with near-term due dates. It is easy to set up an effective project management system on the office's microcomputer database software. The following data elements might be considered the minimum necessary: project number, requested by, date of request, date needed, project name, project leader, priority, status, date begun, and date completed. Reports generated from the system might include project status report by due date, monthly report, project leader status reports, and project lists by number and alphabetically by name. Others can be created as needed, such as an annual report at

year's end. The status reports can be used at periodic staff meetings to track project progress and staff performance.

Institutional Factbook

While laborious and time-consuming to assemble the first time, the traditional institutional factbook has proven to be an effective way to reduce the numerous requests for straightforward data that frequently interrupt your daily work, and it provides the college a common reference so people will use the same numbers in policy discussions on campus. Some institutions have explored the idea of issuing the factbook on microcomputer diskette. Though a promising concept, in execution it often fails. At many campuses, the majority of administrators are not heavy micro users, with the result that they continued calling the institutional research office rather than booting up and searching for the needed file. And until we all routinely carry our laptops to meetings, the diskette version suffers in portability compared to the traditional printed version. The printed factbook remains a useful product. Grant proposals, committee discussions, budget briefings, external reports, college publications, and other places where data are used will report consistent numbers even when the preparers don't contact the institutional research office. (For a useful discussion of factbook design considerations--audience, timing, type and level of data, and means of presentation--given the purposes of

historical record, public relations, and decision support, see Nichols, et al., 1987.)

Networks and Decision Support Systems

If the administrative staff can be networked, a statistical database can be established complete with a query-language interface so that decisionmakers can access basic data themselves, further reducing the routine data requests made to institutional research. Matross (1987), in an excellent Professional File essay on the markets and delivery systems pertinent to "new-style" information centers, argues for targeted reporting systems that not only feature data accessibility and easy-to-use software but also "protect users from making unknowing definitional and analytical mistakes" (p. 5). In the case of decision support systems, one way to do this is to provide a "summary statistics database" of official data, either on-line or on disk, for use by administrators. Rather than having direct access to the original databases of individual records, the decisionmakers access a much smaller set of official data reflecting the adjustments made for federal and state reporting; that way, their inquiries will not produce figures at odds with those externally reported. In addition, "on-demand" preprogrammed reports, accessible by menu choices, can be constructed to answer standard, recurring administrative questions. These serve the needs of occasional users who may

not use the system enough to become adept at creating reports on their own, and who almost certainly will not have a full understanding of the varying reliability and definitional complexities inherent in the use of selected data elements.

Collaborative Projects

Collaborative projects conducted with state agencies and professional organizations can bring large returns on small investments. For example, community colleges in Maryland benefit from numerous data exchanges and analytical projects coordinated by the State Board for Community Colleges (SBCC), in conjunction with the Maryland Community College Research Group (MCCRG). State Board staff provide peer college comparative data, as well as statewide averages, based on enrollment, graduation, discipline cost, and employee data submissions from each of the 17 colleges. A computerized program data monitoring system maintained by SBCC facilitates academic program evaluation. Surveys designed by MCCRG are processed at SBCC, saving the individual colleges data entry and initial analysis costs. Collaborative projects can sometimes garner outside funding support, expanding the cost savings. For example, in Maryland a vocational education grant supported the analysis and report preparation for a statewide study of noncredit, continuing education outcomes.

If your state does not have a statewide institutional research organization, consider starting one. The economies of scale and shared expertise can contribute greatly to individual office productivity.

CONCLUSION

Making the most of available resources is a necessity for today's busy institutional researcher. It is hoped that the personal time management principles, management tools, and technological aids recommended in this chapter will enhance the productivity of institutional research, enabling it to gain the time needed to conduct meaningful policy analysis as well as meet increasing demands for data.

Chapter V

INCREASING INSTITUTIONAL RESEARCH STAFFING

The theme of the 1990 Forum of the Association for Institutional Research was "Institutional Research--Coming of Age." We argue "coming of age" means having sufficient staff and resources to be able to prepare analyses of enough depth and sophistication to constitute a meaningful contribution to policy-making. These will often be conceptually challenging, multivariate studies that may require months of effort. Offices limited to simple data reporting and descriptive analysis due to inadequate staffing are not fulfilling the potential of institutional research and have not come of age!

If you accept the above proposition, you should not hesitate to consciously scheme to increase your office staff and resources. In this chapter we outline several approaches to achieving that happy result. Some are safe and commonplace, others contain considerable risk but greater rewards.

Budget for Consultant Services

If adding personnel is not on the immediate horizon, attempt to obtain budget dollars for consultant services. Even small amounts are worth pursuing; $500 could get a survey analysis completed and written up. Once the budget line is established,

use it for high visibility projects and try to increase it yearly. The larger it grows, the less the financial jump to funding a staff position!

Faculty Research Associates

One way to increase your office's analytical capability is to utilize college faculty on released time. Faculty in the natural and social sciences, mathematics, business, and other departments may have the skills and the inclination to apply them to institutional research needs. Faculty research associates may be used to complete projects on an intermittent basis, as projects arise that fail to make the priority list but attract faculty interest. The cost to the college is reasonable, usually the cost of hiring part-time adjunct faculty to cover the research associate's course load. Depending on the project, the faculty member may be released from teaching for an entire semester, or just one or two courses. A caveat, however: the institutional research director should attempt to influence (if not have final approval over) both the specifications of the project and the appointment of the faculty research associate. The initial effort at Prince George's Community College in Maryland was an outgrowth of an existing faculty professional development leave program, in which a humanities professor proposed a survey of high-ability high school students to aid in development of a campus honors program. The project was approved

with minimal input from the institutional research office. The problem was the faculty member in question knew nothing about survey research or data analysis! So institutional research did the work, the faculty member had the semester off, and it was clear some guidelines had to be developed--but the important precedent of utilizing faculty in the institutional research office was established. Informal arrangements were subsequently agreed upon with the dean of instruction, so the institutional research director is now an active participant in any faculty institutional research project decisions. The process has worked well in the two most recent cases: a biology professor conducted and analyzed a faculty professional development survey, and a speech communications professor conducted focus group research on the needs of adult students.

Replace Your Secretary!

Microcomputing has eliminated much of the traditional function of the office secretary. No longer needed to type and proof statistical tables and draft after draft of research reports, since these are now done by the originating analyst using spreadsheet, database, and word processing software, the traditional role is largely obsolescent. Consider changing the job description for this position. You might arrange a transfer of your secretary, should she or he have limited mathematical and computer aptitude, to another office in need of clerical support,

in exchange for a new research technician position. While this new position might continue main office phone coverage, and monitor the office budget and payroll function, the majority of its responsibilities would involve research tasks including data entry and tabulation, administration of surveys, preparation of graphics, and elementary statistical analysis. It may be possible to train an existing secretary to do these tasks, but I recommend, if circumstances permit, a new research technician position that enables you to recruit based on research and statistical skills.

Pursue Grant-funded Staff Positions

Substantial staff help can be obtained through grant-funded research positions. For example, colleges that qualify for Title III institutional strengthening grants may be able to develop activities with substantial research components justifying funding of new positions. Depending on the activity, even full-time research positions may be funded for periods as long as 3 to 5 years. At PGCC, we have had two Title III activities that funded research support. The first, an Occupational Program Management System (OPMS), developed a system for monitoring the college's growing set of occupational programs in the early 1980s. The lasting impact of the activity, 5 years later, is continued use of several OPMS performance indicators, such as inferred program cost, and continued faculty involvement in

formal program evaluation. While the grant was active, several program evaluation tasks that the institutional research office could not have attempted due to workload demands were completed by OPMS. A final legacy: the full-time OPMS-funded management systems analyst is now on the operating budget as the college's supervisor of institutional research. The second Title III grant, in the late 1980s, funded a Management Accountability and Cost Effectiveness activity (MACE). MACE was partially used as a vehicle for decentralizing instructional decisionmaking, by increasing the responsibilities of associate deans. To support this intention, several divisional decision support systems were established, under the guidance of a grant-funded research and planning analyst working in the institutional research office. During the three-year grant, enrollment and staffing analyses at the academic division level were routed to the grant activity to assist in the development of the decision support systems.

Seek Out New Opportunities to Contribute

The strategy for increasing staff with the greatest risk is to seek out new opportunities to contribute research and analytical support to top management. Advocating the pursuit of more work as a solution to work overload sounds irrational, but there is a certain logic to it. The idea is to break out some time to provide something new and valuable to people in a position to help you get more staff. Show them how institutional

research support can be of value to their immediate concerns, and how this support could be ongoing if institutional research had the necessary staff. Ideally, the new contribution will be highly visible as well as valuable. You will need to be proactive and attuned to what looms on the administrative horizon to identify these opportunities.

To illustrate, three examples at Prince George's Community College will be reviewed. In the early 1980s, the newly appointed research director noticed that collegewide planning was not based on any formal acknowledgement of changes in the institution's service area. No systematic examination of external demographic, economic, or social trends or forecasts appeared in planning documents. The research director explored the literature on the corporate technique of environmental scanning (see Clagett, 1989a), and prepared a formal "ENSCAN" report for the president's staff. The president had him subsequently share the ENSCAN findings with the college's board of trustees, the faculty senate, and the classified staff organization. Environmental scanning is now an integral part of the college's annual planning process, and a permanent new role for institutional research in planning was established. This new role is manageable (Clagett, 1989b), elevated the visibility and importance of institutional research at the institution, and largely justified a later addition to the research staff.

The second example is student outcomes assessment. Higher education accountability first became an issue in Maryland in 1980, when legislative auditors pointed out that state colleges and universities provided little documentation that the state's financial investment in higher education was achieving desired student learning outcomes. Throughout much of the 1980s, the State Board for Higher Education studied various options, including statewide testing, but nothing was decided until 1988, when accountability requirements were included in a higher education reorganization law. Anticipating this, the research director prepared during 1988 a comprehensive Student Outcomes Performance Accountability Report, 84 pages summarizing the findings of existing student outcomes assessment at the college (Clagett, 1988). Issued before the higher education commission had determined the format of the mandated accountability reports, the "PGCC model" was widely discussed statewide, led to the institutional research director's appointment to the higher education commission's accountability committee, and made the institutional research office the focus of accountability efforts at the college. A modest amount of additional resources was allocated to institutional research in recognition of this expanded responsibility, which, together with the enlarged role in planning, was sufficient justification for the approval of a new full-time analyst position.

The third example of seeking new opportunities to contribute is just underway. To assist in college marketing and enrollment management, the office is embarking on an application of lifestyle cluster analysis to learn more about the residents of its service area. Based on factor analyzing a 270-variable file of census tract data, a number of neighborhood types or lifestyle clusters will be identified. It is anticipated that this detailed description of the college's service area will assist in general marketing and program development, with subsequent geo-coding of student record data permitting a new form of enrollment analysis. Lastly, promotional materials will be designed for specific clusters that, together with targeted mailings, promises to be a cost-effective marketing approach.

These three initiatives did indeed increase the institutional research workload. They also increased office visibility, importance, resources, and staffing. Three different deans were provided valuable new services: the dean of administration (environmental scanning for budget planning), the dean of instruction (student learning outcomes for accountability), and the dean of advancement (cluster analysis for recruitment and marketing). Three strong allies for continued institutional research support, which may prove critical if retrenchment actions should threaten future office budgets or staffing profiles.

Promote Office Visibility

In a phrase: be valuable and visible. Learn and apply the principles of presenting and interpreting data to management summarized in Chapter III. Welcome opportunities to share research findings with campus constituencies in oral presentations. Consider publishing a brief but widely circulated office newsletter. Take the time to document institutional research contributions in your college's Annual Report. In your own monthly reports, include a sentence or two summarizing the major insights of research studies, rather than just listing them. In short, remind people how valuable the institutional research function is by making your contributions visible.

Request and Justify at Appropriate Opportunities

Annual budget requests should include staffing requests backed up by a detailed justification statement. Explain how existing resources are being used productively, and describe specific projects--beyond current office capabilities--that could be accomplished with the added staff member. If you have a temporary position producing valuable output, make the case for funding the position on the operating budget to ensure continuation of its contribution. If you cannot write a persuasive justification, you shouldn't be seeking the position!

The timing and frequency of staffing requests need to be carefully considered. Every new request for service should not be responded to with an inadequate staffing refrain. Keep a record of unmet requests of obvious merit (use your project management system); this can be a source for your annual justification statement. Do not be discouraged if your position is turned down but be persistent in its advocacy. Build an alliance of project seekers who will support your request at the opportune time.

CONCLUSION

While some believe that financial pressures on higher education institutions will restrict the expansion of support functions such as institutional research, it can be argued that such pressures may make effective institutional research more valuable. This chapter has attempted to outline ways in which institutional research can gain sufficient resources to fulfill its potential for significant contributions to institutional decisionmaking.

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