Association for Institutional Research

PROFESSIONAL FILES | SPRING 2015 VOLUME

Supporting quality data and decisions for higher education.

Letter from the Editor

Association for Institutional Research

This volume of Professional Files brings us two articles on very different topics, but with a common theme—relationships.

Wang introduces Social Network Analysis, a data visualization technique that focuses on the relationships among cases, instead of just their attributes. Her three examples applying this technique to common IR study questions will make you want to start building your own SNA models right away!

Carpenter-Hubin, Sullivan, and Herbers share their experience building relationships with faculty through a collaborative study of faculty workload and resources. Their insights into how to work as peers respectful of each other's expertise can serve as a model for our own research partnerships.

Consider this a reminder to nurture your own relationships with IR colleagues by sharing your work in AIR Professional Files!

Sincerely,

Sharron L Ronco

Sharron Ronco

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Association for Institutional Research

TWO HEADS ARE BETTER THAN ONE:
A Collaboration between Institutional Research and Faculty for a More Meaningful Analysis of the STEM Faculty Experience

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About the Authors
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Abstract
Institutional researchers come to their field from a variety of educational and work experiences. Regardless of their expertise, however, it is difficult—if not impossible—for a single researcher, or even a large team of researchers, to know and understand all the nuanced differences among the many disciplines found in a comprehensive university. This paper discusses the collaboration between institutional researchers and faculty to evaluate the faculty experience in science and engineering. Rather than discussing the outcome of that evaluation, this paper focuses on the value of the collaborative process.

INTRODUCTION

The Ohio State University's project Comprehensive Equity at Ohio State (Project CEOS), which was funded by a grant from the National Science Foundation, focuses on retention of women faculty in the STEM disciplines (science, technology, engineering, and mathematics). Project CEOS has worked intensively with administrators and faculty in three STEM colleges (Engineering, Veterinary Medicine, and the Division of Natural and Mathematical Sciences within Arts and Sciences). Project CEOS researchers wished to study and evaluate resource allocation and working environments for men and women faculty in these units to understand whether Ohio State has problems similar to those identified in the landmark Massachusetts Institute of Technology (MIT) study, "A Study on the Status of Women Faculty in Science at MIT" (Chisholm et al., 1999), described below.

At the request of Project CEOS, the Office of Academic Affairs appointed a committee to study resource allocation and working environments. The committee was charged to identify important resource parameters of the work environment for faculty, and then to measure those parameters appropriately in order to ascertain whether gender was an explanatory variable.

The committee included four women and five men holding the following staff and faculty positions:

- Assistant vice president, Institutional Research and Planning
- Associate director, Institutional Research and Planning
- Director, Human Resources Organizational Metrics and Data Analytics
- Professor, Evolution, Ecology, and Organismal Biology; principal investigator, Project CEOS
- Chair, Faculty Compensation and Benefits Committee; professor, Comparative Studies
- Professor, Veterinary Biosciences
- Associate provost and director, The Women's Place; professor, City and Regional Planning
- Professor, Statistics
- Professor, Electrical and Computer Engineering

The results of the committee's work have been published in a special report (Herbers & Desai, 2012). The actual findings are of interest, but here we focus on the value of the collaborative process, with particular emphasis on the insights brought to bear by the faculty who work in the relevant environments and how those insights shaped the analysis. Our experiences show how understanding patterns in data concerning faculty work is best achieved through collaboration between institutional researchers and faculty from multiple disciplines in the discussions and analysis. Furthermore, such efforts provide faculty with opportunities to learn about disciplines outside their own.

COMMITTEE BACKGROUND

"Institutional researchers should seek opportunities to collaborate with faculty. They can provide a valuable service to faculty and enhance the scholarly value and intellectual rewards of their own work" (Delaney 2009, p. 35).

Colleges and universities rely on research professionals for the collection, reporting, and analysis of institutional data to support decision-making and to provide for accountability. These institutional researchers work with data sets that address a wide range of topics, including budgets, personnel, students, and square footage of lab space to develop an overall portrait of how the institution works. Given the range of research topics, it is not surprising that the educational background of institutional researchers is anything but standard. Nationally, 30 percent of all institutional researchers hold their highest degree in the social sciences, with another 60 percent distributed fairly evenly across education, STEM fields, and business. The remaining 10 percent are found in humanities and other disciplines (Volkwein, Liu, & Woodell, 2012). The committee had access through its two Institutional Research and Planning (IRP) members to the expertise of the full IRP group at Ohio State; members of that group hold advanced degrees in public affairs, business administration, psychology, library sciences, and higher education and student affairs. This combination of education yields a team that is trained in quantitative and qualitative research, program evaluation, bibliometrics, semantic analysis, and project management. With an average tenure at Ohio State of more than ten years, the institutional research (IR) staff also has valuable historical knowledge of the university.

The faculty expertise on this committee was highly quantitative. Because they come from science and engineering backgrounds, the faculty members were able to think carefully about confounding variables, outliers, methods for pooling data, and specifics of statistical analysis. Their understanding of how their work is represented by institutional data and how that representation can be skewed by faculty whose work lies outside his or her disciplinary norms was tremendously important to this study. This evaluation required us not only to analyze existing data, but also to delve into local department culture to understand those data.

IRP staff have worked closely with Ohio State faculty over the years, most commonly providing, as suggested by Delaney, "a valuable service"— data and analysis to support faculty scholarship or for faculty bodies to consider as part of faculty governance and decision-making. This project, however, had a distinctly different collaborative approach. Committee members recognized from the beginning that both staff and faculty had important contributions to make, with staff responsible for providing quality data and analyses, and faculty responsible for ensuring that the data were gathered and the analyses were performed with the appropriate background understanding and context. The committee learned early in its deliberations, however, that faculty were not always knowledgeable about research and teaching norms in STEM disciplines other than their own. The process of establishing context for the data thus became one of discovery by the whole committee, rather than instruction from faculty to staff. The IRP staff and faculty were peers on this project, each contributing her or his own methodological and content expertise for the good of the committee as a whole.

THE EVALUATION

As the first effort to evaluate STEM faculty resource allocation and work environment by gender for our institution, this project required careful deliberation before plunging into data analysis. The committee members were highly aware of the potential impact of a study that included gender as a variable. It therefore became imperative that we develop methodologies that would stand up to intense scrutiny.

The committee met every other week over a three-month period and interacted frequently via email, spending the first several weeks discussing its charge and what kinds of data would be most important. The first decision was to concentrate on resource allocation to tenure-track faculty, because this group demands the greatest share of faculty resources, and because the institution makes long-term commitments to its tenured faculty. Our discussions at this stage centered on the kinds of resources important for faculty as well as the kinds of data that were available. Faculty members on the committee brought up a suite of issues for which centralized data simply do not exist (e.g., advising loads, library resources, and opportunities for collaboration). The interplay between staff and faculty at this stage was crucial: as faculty members brought up resources they considered crucial to their professional success (library subscriptions to certain journals, availability of certain equipment, access to graduate student assistants), IR staff found themselves challenged to identify appropriate measures from their databases. Ultimately, the committee settled on four parameters of most interest for resource allocation: salary, start-up accounts, square footage of lab space, and teaching loads. Not all identified data were available through central institutional repositories, but faculty members of the committee were able to identify additional data sources. This supplemental information included data on start-up accounts offered to incoming faculty and data on teaching loads for the health sciences disciplines, whose teaching assignments are not accurately captured in the institutional data maintained by the Office of Enrollment Services. These additional data were available from college deans' offices. Next we describe the discussions that led to the final analysis reported in Herbers and Desai (2012).

Literature Review

Faculty and staff on the committee reviewed previous scholarship related to gender disparities in faculty salaries, teaching, and service assignments and research productivity. Most such studies base their work on survey data, and often use the National Survey of Postsecondary Faculty as a source. Recently, the National Research Council released *Gender Differences at Critical Transitions in the Careers of Science, Engineering and Mathematics Faculty,* which looked not only at salary and workload issues, but also at the allocation of laboratory space and start-up packages (National Research Council, 2010). Data for this study were collected through a survey of tenured or tenure-track faculty and department administrators from the 89 universities then categorized as Carnegie Research I.

Perhaps the most well-known study of gender disparities in science disciplines at a single institution is the MIT study "A Study on the Status of Women Faculty in Science at MIT" (Chisholm et al., 1999). A faculty committee collected data from the Office of the Dean of Science and from institutional researchers in the MIT Planning Office. In addition, that faculty committee conducted interviews with women faculty and department heads. This study found that female faculty received lower pay and fewer resources than their male colleagues, despite equal professional accomplishments.

It became apparent to the Ohio State University committee that many of the variables used in these earlier studies were already collected in our institutional data sets, with additional data collected by individual colleges. Thus, the committee decided not to include a faculty survey in the research and analysis design.

Faculty Salaries

IRP provided faculty salary data, normed to a nine-month appointment. In our initial review of those data, we discussed determinants of faculty salaries that complicate the kind of granular analysis we intended (e.g., rank, time in rank, discipline, scholarly record). Because we were most interested in determining whether a gender gap existed for salary, the committee needed to employ techniques that would eliminate potentially confounding factors. The discussion on these factors was robust and lively. Committee members readily agreed that salaries for assistant professors are relatively uncomplicated, reflecting starting salaries at market and a short timespan within that rank. Thus evaluating salaries for assistant professors required that we control for market conditions but relatively little else.

By contrast, salaries for tenured senior faculty reflect a multitude of factors: (1) salary compression, which results when raise pools do not keep pace with market increases in starting salaries; (2) time in rank, which should reflect the number of raise cycles leading to higher salaries for those promoted years ago; (3) the system of merit raises employed by the institution, which produces variation within a cohort that reflects differential productivity; (4) other market forces (e.g., external offers, hires from other universities, previous administrative experience, demand for a particular focus within a discipline), which lend further nuance to data interpretation. In order to focus on the variable of greatest interest, gender, we had to control for other factors that affect faculty salaries.

The committee started by eliminating outliers (e.g., administrators including deans, associate deans, and chairs) as well as individuals holding endowed professorships and those with recent prior administrative experience (e.g., former deans). Even though the salary data were deidentified by IR staff, the faculty representatives were able to infer identities of many individuals involved; the discussions that devolved allowed us to make valid decisions on potential outliers. In particular, the faculty representatives were able to note individuals who had been hired or named as University Distinguished Professors or Eminent Scholars. To a considerable extent, this identification of especially stellar faculty as outliers reduced the effect of other market forces.

The initial data analysis was granular, but it quickly became apparent that some pooling would be needed because of the paucity of women in some departments or ranks. The committee therefore spent considerable time discussing how to aggregate faculty into groups for statistical analysis. Time in rank for associate professors can reflect norms about how long individuals serve in that rank. Conversations among the faculty representatives revealed that the expectation for the length of time for promotion to professor in some units is within five years, whereas the norm in other units is within seven or eight years. Committee members agreed that faculty members who had been associate professors for 11 years or longer were likely to be less productive than those who had been promoted within that time frame. Thus, pooling among associate professors should reflect variation in the norms for promotion to professor as well as the shared perception of lower productivity for long time at that rank.

Similarly, faculty revealed during the group discussions that some departments routinely hire at the professor rank, while others do so rarely. While this is information that can be discovered and confirmed from the data, this hiring practice was not known to the IRP or the Human Resources staff. Furthermore, this information would not have been established without the faculty input. The institutional data showed time in rank only at Ohio State, and thus were only interpretable for those who had spent most of their career at our institution. One of the more difficult topics for salary analysis was how to pool groups of professors. After considerable discussion, the committee settled on the following seven categories of professors:

1. Assistant professors
2. Associate professors in rank 0–5 years
3. Associate professors in rank 6–11 years
4. Associate professors in rank 12+ years
5. Professors in rank 0–5 years
6. Professors in rank 6–11 years
7. Professors in rank 12+ years

The committee also spent considerable time discussing market forces across disciplines. Entry-level salaries, a reasonable indicator of market conditions, varied substantially across the departments the committee studied. The IR staff were able to provide an initial examination of those markets, and the committee then grouped departments that shared similar market forces, with the stipulation that departments would be pooled only within a college. For example, salaries for electrical engineers and computer scientists were comparable, as were salaries for geologists and ecologists.

After these discussions, the committee agreed that we had a reasonably valid data set to examine and recommended evaluation of the data using multiple regression, with gender as both a main effect and an interaction term with rank, time in rank, and department group. Scholarly record was not included in the analysis, in part because the variance by rank and by disciplines meant that classifying faculty according to their level of productivity was problematic.

Start-up Costs

In the STEM disciplines newly hired faculty are offered funds to support purchase of equipment, hire laboratory personnel, and travel. These start-up accounts are negotiated as part of the original offer, and they can be substantial: for hires at the professor level in the experimental sciences, start-up accounts exceeding $1 million are common. There is substantial variation across disciplines with regard to normed start-up figures, and even within departments there can be wide variation that depends on the research area of faculty being hired.

Discussion revealed how difficult it can be to interpret those data. First, no standard definition exists for what is included in start-up costs. In addition to the start-up account, commitments to new faculty can include laboratory/office renovations, major equipment purchases, summer salary support, graduate assistant support, and time released from teaching; all of these additional measures help to attract the best faculty and should not be discounted. Even so, the committee was forced to restrict its attention to the start-up account in the narrowest sense.

The IRP staff collected start-up data from college offices and provided it in summary form to the committee. This was the first time the IRP staff had collected start-up data, and they were guided entirely in their collection and analysis by the committee faculty. Faculty representatives were able to highlight complications in the data, and to suggest ways to move toward a statistical analysis. First, the rank of hire mattered: senior hires demand and receive larger start-ups than do entry-level faculty. After discussion, the committee decided to examine only start-up data for new hires as assistant professors, which represented reasonable sample sizes for both men and women.

Even so, pooling of data across departments became important again. Our discussion showed that the categorizations of faculty by rank and years in rank were not necessarily useful for analyzing start-up accounts. Faculty expertise about market forces that determine start-up accounts was critical to identify clusters of departments that were similar, but not identical, to those developed for faculty salaries. As an example, Chemical and Biomolecular; Materials Science; and Mechanical and Aerospace were clustered based on faculty advice, whereas Biomedical Engineering was kept separate. This was not a decision that staff could have made based on data available to them.

A final additional complication derived from subdisciplinary differences within a unit; for example, theoretical scientists and empirical scientists require very different infrastructure yet reside within the same department. While acknowledging the issue, faculty recommended that the committee ignore it.

Therefore, the final analysis of start-up data focused on assistant professor hires and became a simple 2-way ANOVA with gender and disciplinary cluster as independent variables.

Lab Space

Lab space is highly prized by experimentalists. Rooms for specialized equipment; bench space for students, postdoctoral researchers, and technicians; as well as ancillary spaces (e.g., conference rooms, common equipment rooms, and office space) contribute to faculty research productivity. The quality of the lab space matters, with clean modern lab space in a well-maintained building serving as an important recruitment tool.

Our institution uses square footage of lab space as the primary datum, without information on quality; from the outset, then, the committee had to ignore issues such as age of the building, years since renovation, reliability of infrastructure, and other measures of space quality. Furthermore, centrally collected data on lab space assignments by gender were available only for faculty with externally funded research; new hires as well as more senior faculty without funding were not included in that database, and centralized data did not allow us to examine usage of shared space, equipment space, and office space. One of our colleges had conducted its own space inventory that was comprehensive, but for the other colleges the committee had incomplete data focusing solely on square footage of research laboratory space.

The committee discussed issues concerning lab space assignment, for which decisions are local and idiosyncratic. A scientist with 2 graduate students and 1 postdoctoral researcher requires fewer benches than a colleague with 15 graduate students and 6 postdoctoral researchers. Those who travel to do their research (e.g., tropical ecologists, field geologists, high-energy physicists, astronomers) command less space than those who gather data primarily in Ohio State labs. Thus the amount of space assigned to a faculty member reflects a myriad of variables invisible to IR staff.

Despite those complications, the committee did have some a priori expectations. Overall, junior faculty require less space than senior colleagues, leading us to include rank as a covariate. Similarly, the amount of external funding can drive space needs. Finally, the ethos of space assignments is relatively constant within a department. The committee ultimately agreed that the data could be analyzed via a regression model with rank, gender, total external funding, and department as independent variables, but were aware of numerous unmeasured factors that could explain additional variance.

Teaching Assignments

Teaching includes a variety of different modalities, and each institution—and, at Ohio State, each college within each institution—sets its own definition of how teaching is measured. In the sciences, teaching includes classroom lecturing, overseeing graduate research assistants who offer laboratories and recitations, proctoring and grading, leading seminars and colloquia, supervising graduate and undergraduate research students, and supervising students in clinics. Disciplines vary in the distribution of courses offered (some have heavy service course responsibilities while others primarily teach their own majors), norms for team-teaching, class size, numbers of graduate students, and so on.

The committee examined centrally collected data that sparked illuminating discussions that revealed widely divergent department mores. First, the committee learned that units vary substantially in how they report instructors of record; for example, a single course may be taught by four or five faculty, with only one recorded in the registrar's database. Indeed, one of our college representatives stressed that those central data failed entirely to capture the relevant effort information; for that unit the committee used college-supplied teaching data.

Faculty discussions of practices in their own departments enlightened committee members, faculty, and staff alike as to how differently units handled academic-year release time. Faculty who secure external funding can use those dollars to support a portion of their salary, which in turn releases them from teaching. In some units, garnering such release time is the expectation whereas in others it is disallowed. Not surprisingly, faculty in those units for which release time is an expectation teach less than those in which it is not permitted.

Third, considerable variation in teaching load derives from enrollments in courses collectively binned as independent studies courses; these include readings, seminars, research supervision, and other kinds of tutorial efforts. Most units hold expectations for faculty to engage in such activities, but they are rarely codified. Rather, faculty have broad discretion accepting students to their research groups, offering seminar courses, and supervising undergraduate internships. Furthermore, many faculty members supervise students who are not enrolled for credit. These kinds of teaching efforts typically are not assigned as part of a workload discussion, but rather are undertaken on the basis of individual faculty initiative. Even so, units can use data on independent studies teaching to make assignments for didactic teaching, such as providing a course release for a faculty member supervising independent studies for 12 graduate students.

Fourth, didactic courses themselves vary tremendously in terms of the kinds of effort required of faculty. Large introductory courses require extensive administrative overhead (managing the course Web site, answering endless emails, overseeing teaching assistants), whereas smaller upper-division and graduate courses require a different kind of preparation. Committee discussions on this topic again uncovered variable cultures across disciplines in terms of the mix of such courses offered, as well as the kinds of students who enroll. Some units offer numerous courses to benefit students outside their discipline (general education or other service courses), while others serve primarily their own majors. After discussion of these complications, we settled on three categories of didactic instruction (introductory, advanced undergraduate, and graduate/professional).

The committee wrestled with several measures of teaching effort, including the number of courses taught, the number of credits hours taught, the number of contact hours associated with a course, and the number of students taught per term. Of those four, the committee settled on the first two as the best metrics for comparing teaching loads among faculty.

Ultimately, we settled on regression analysis of number of courses and number of credit hours as a function of gender, faculty rank, discipline, and course level.

CONCLUSIONS

Gender did not explain variation in our analyses, which is heartening (Herbers & Desai 2012). Most importantly, that central result is credible because of the committee discussions that acknowledged nuance, and decisions that allowed for comparisons that minimize confounding variables. Analysis of faculty workload and access to resources are fraught with difficulties (Dennison 2011), and can best be accomplished when IR officers collaborate with those whose work they are studying: in other words, the faculty.

Our process took over a year to complete, including iterations of analyses and refinement of the baseline data. Committee members, each steeped in one discipline, continually learned from each other about how variable department cultures can be within one institution. Furthermore, we all learned about the power and limitations of centrally collected data as we strove to develop protocols for meaningful data analysis. Our experiences showed that involving faculty for analysis of data about their work is crucial to producing reliable and credible results.

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