Listening to Those We Serve: Assessing the Research Needs of University Faculty

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Authors' Note

This article is based on preliminary presentations delivered both to research administrators and university faculty at the University of South Florida, a research-extensive institution that serves as the context for this investigation. In accordance with the University's rule 6C4-10.109.B-6, the authors confirm that the opinions stated herein are their own, not the university's. The corresponding author is Carol A. Mullen, PhD, The University of North Carolina at Greensboro, camullen@uncg.edu.

Abstract

This study presents findings from a university-wide faculty survey on research resources at a top-tier research institution in the United States (U.S.). The researchers (faculty leaders) designed the original instrument, submitted it for critique and validation to a faculty senate's research body, and solicited participation from all colleges. The principal investigators sought to identify impediments to research and scholarship, as perceived by faculty. The questions posed were: What specific types of resources do faculty members deem important to facilitate their research activities? Are financial and non-financial resources deemed equally important? Do junior and senior faculty members differ in their views on the importance of various resources as valued resources? Are there differences across academic units in the degree to which particular resources are valued? The survey also elicited faculty perceptions of the level of research support actually received and demographic information about the faculty respondents, their recent research and scholarship activities, and their attitudes towards various types of incentives for research. The survey was distributed

to all faculty members (1,474) at the University. It was completed by 305 faculty, yielding a response rate of 20.6%. Results obtained reveal that across all faculty ranks financial and material resources are deemed critical for supporting faculty members' research efforts. Intellectual and scholarly resources, such as the availability of research mentors, were deemed significantly more important by junior faculty. The results should be of interest to anyone seeking to enhance the research output of the academic enterprise.

Keywords: Faculty survey, research support infrastructure, faculty perceptions, level of support, research resources, organizational culture

Introduction

Universities around the world are constantly pressured to improve in response to environmental influences and competitive forces. The desire to ascend the rankings ladder drives the resource allocation decisions of university administrators worldwide (Clarke, 2004), and in such countries as China (Ng & Li, 2000), the United Kingdom (Tapper, & Salter, 2004), and the U.S. (Tierney, 1999). Since ranking methodologies invariably place a significant emphasis on faculty research and scholarship productivity, university leaders and consequently faculty members are constantly seeking to enhance their research profile (Tien & Blackburn, 1996).

While few would argue that it takes resources (primarily financial) to enhance the research productivity of faculty, our purpose in this study was to examine more nuanced questions about how research and scholarship activities at a large public university can be enhanced. In particular, we attempted to identify faculty members' perceptions of impediments to research and scholarship by asking the following questions: What specific types of resources do faculty members deem important to facilitate their research activities? Are financial and non-financial resources deemed equally important? Do junior and senior faculty members differ in their views on the importance of various resources as valued resources? Are there differences across academic units in the degree to which particular resources are valued?

Answers to such questions will be informative to large universities worldwide as research administrators and faculty leaders seek ways to facilitate research at their institutions. So that bridges can be built between these often fractious cultures (faculty and administration), research administrators need to have opportunities for listening to those they serve, as well as data upon which to plan new ways forward.

This paper reports the results of original research in the form of a university-wide faculty survey of research resources. The context for this investigation is a university in the southeastern U.S. classified as a Carnegie research-extensive, doctoral-granting, public institution. The survey instrument elicited the perceptions and perplexities of faculty regarding the importance of various research support factors and the level of support they reported having actually received. The survey also sought demographic information about the faculty respondents, including self-ratings of scholarly output, activities actually engaged in, and feelings toward research incentives.

Although the results on the level of support dimension are specific to one university, the findings on the degree of importance dimension are relevant for other large, research-oriented universities. Research-related areas and concerns addressed

by full-time faculty of all ranks and from various colleges were identified. As such, this study should be of interest to directors of sponsored research, college deans, and anyone else engaged in developing the internal research capacity of universities and facilitating the scholarly performance and contribution of faculty.

Background and Related Literature

A seriously underdeveloped area of scholarship involves study of university research resources through the eyes of faculty. This focus lends a very different perspective than the traditional administrator-driven view from above, which often perpetuates top-down stipulations for funding, recognition, and reward structures. In the U.S., the traditional emphasis has been on organizational support for faculty success with regard to the acquisition, discovery, and application of knowledge. However, depending on the selected lens for viewing the role of university resources in supporting faculty, the results can vary tremendously. Accordingly, the university portrait we provided with respect to an institution's capacity to support research is strictly faculty informed and context specific.

Related Studies

Scholarly sources dealing with university-wide investigations of faculty perceptions of research resources are few and far between. What was typically located through Internet database searches, conducted from 2005 to 2007, are internal research reports generated by administration, research, and management offices. The authors of these various reports argue the need to build capacity for research development and even to rethink and rebuild stagnant research infrastructures. These reports are generally not based on empirical investigations of faculty perceptions but rather analyses garnered through task forces, internal audits, or accreditation visits. In such cases, it is often recommended that increased funding be applied to the internal research infrastructure, including library and operating budgets of units and colleges; it is also recommended that faculty education occur in the importance of developing and maintaining research agendas and attracting external grants and contracts (Rice, 2000). University management teams commonly assert that, to achieve their vision, it is critical that planning processes pay close attention to the current resource situation; it is recommended that strategies be devised for effectively cultivating and using financial, human, and physical resources.

Another pattern we uncovered through the paucity of available material on this subject underscores that even when faculty members' views are taken into account, these may be collapsed with that of administrators' views, making it difficult to know what faculty are actually thinking and recommending. In one such instance, 42 surveys were collected by Carnegie Mellon University researchers who reached out to administrators and faculty alike at various universities to determine the research administrator's role in creating a supportive environment for interdisciplinary research (Laughlin & Sigerstad, 1990). It was discovered that individual faculty members are critical in initiating interdisciplinary research activity and that administrators are indispensable to the effort of making funding available and of facilitating a proactive and supportive environment for doing research.

Using data from a National Research Council study on research-doctorate programs in the U.S., Dundar and Lewis (1998) investigated factors that explained the research productivity of 1,841 doctoral programs at 90 research universities. The

proxy for research productivity employed was the publication of journal articles, which comprised the primary dependent variable in the study. Independent variables included in the regression model comprised doctoral program size, concentration, and percentage of faculty publishing, percentage of faculty who were full professors, institutional library expenditures, ratio of graduate students to faculty, percentage of faculty with research support (i.e., funding), percentage of graduate students who hold research assistantships, and institution type (public or private university). These explanatory variables were found to be significantly associated with research productivity, with some differences across the four clusters of fields investigated -- biological sciences, engineering, physical sciences and mathematics, and social and behavioral sciences. While Dundar and Lewis (1998) shed light on macro-level factors associated with a narrowly defined measure of research productivity, what remains unclear are the specific impediments to research and scholarship activities as perceived by faculty.

A more recent survey of over 6,000 faculty members at institutions with significant federal funding for research shed light on the administrative burden faced by grant-funded research faculty (Decker, Wimsatt, Trice, & Konstan, 2007). Most respondents were from the hard sciences (primarily the medical sciences) and received funding from the National Institute of Health and the National Science Foundation. Results of the survey revealed that an alarming 42% of the time committed to federal research was consumed by pre- and post-award administrative activities rather than to active research. Faculty reported being burdened by requirements to submit progress reports on grants, hire personnel for projects, purchase equipment and supplies, and comply with institutional review board (IRB) procedures. Also revealing is the finding that 95% of respondents reported that they could spend additional time on active research if they were provided with more assistance for handling research-related administrative tasks. As an indication of the severity of the problem, 76% of the faculty indicated being willing to reallocate direct costs to fund administrative support for research-related activities. It should be noted that the Decker et al. (2007) survey was aimed exclusively at impediments to federally funded research, whereas the survey reported in the current paper is broader, examining issues such as intellectual and scholarly resources.

Of interest, it was also discovered that several U.S. universities had conducted similar studies of their research cultures and needs. Columbia University, East Tennessee University, and the University of North Carolina (both at Chapel Hill and at Greensboro) are all noteworthy. Three observations emerged from comparing the efforts at these institutions to our approach. First, some of the identified needs are similar across institutions (e.g., graduate students, project start-up and support, low level of support from central administration). Second, a qualitative analysis of open-ended responses allowed a more phenomenological grasp of faculty members' situations. Third, our quantitative approach was also unique in allowing the identification of problems with the research support infrastructure and relative gaps in research support resources. The universities we examined applied a slightly different methodological approach to the study of their contexts. Despite different methods or settings, however, a very small sample of universities produced some similar themes for universities trying to attain greater heights in research stature.

Method

Over the years, strategic planning became a major initiative of central administration at the University being investigated. As an organization seeking status as a premier, national-level, research institution, the time had come to investigate, through a faculty-led grassroots initiative, what it would take to help accomplish this identity goal. To attain consideration from key decision makers and to recommend any potential changes to grant support and related research infrastructures, it was necessary to ascertain faculty perceptions of the importance of various research resources and the level of support actually being provided in each instance. A survey of faculty would highlight key research-relevant areas in need of improvement while providing a vehicle for faculty input in the University's strategic planning process.

Survey Design and Deployment

The researchers created the survey and the university-wide faculty research committee, consisting of representatives from all colleges, provided critical review and ongoing input. This committee, known as the Research Council (RC), is a body of the University's Faculty Senate; it is charged with advising the University administration on matters pertaining to research activity. The overarching goal of the survey was to support the RC's advisory mission and strengthen the credibility of its recommendations to upper administration through expanded input from faculty. In spring 2005, under the researchers' leadership, the RC formed a Faculty Research Survey committee charged with drafting the faculty survey instrument. The survey was designed to solicit information from faculty at all ranks and from all colleges across the University concerning deficits in research support and infrastructure. The intent of this instrument was to assess the degree of importance faculty placed on several resources required to support research and scholarship and to assess the level of support received on each resource factor regardless of its source (i.e., department, college, or university).

Questions regarding resources for research and scholarship were divided into 8 categories: (a) seven questions relating to financial resources, (b) nine questions relating to material resources, (c) seven questions relating to human resources, (d) eleven questions dealing with intellectual/scholarly resources, (e) four questions targeting administrative/academic support, (f) six questions on pre-award grant support, (g) five questions on post-award support, and (h) four questions regarding support for dealing with research integrity and compliance issues. Open-ended questions were included in all sections of the survey. The concluding section started with an open-ended question soliciting specific concerns and suggestions for the RC. The second question prompted the listing of three key problems or issues that inhibited the participant's research, scholarship, and creative endeavors. Additional questions in the final section elicited demographic information regarding the respondent's college/department, rank, tenure status, years spent at the university, self-ratings of scholarly output, and types of scholarship in which the faculty member had recently engaged. Finally, faculty members were asked to indicate their level of agreement with each of eight incentive mechanisms for increasing externally funded

research and scholarly productivity at the University. Before undertaking the survey, respondents were prompted to choose between the full and short version of the instrument, a strategy used to increase the response rate. The short version bypassed the detailed, category-specific, questions, taking the respondent directly to the concluding section.

The final version of the researchers' survey instrument reflected input from the RC membership, as well as the associate deans for research of the University's 12 colleges. The survey was posted on the web. Email solicitations were sent to all faculty members, with separate requests for participation from key stakeholders (associate deans within each college and college-level RC representatives).
The survey was granted an exemption by the IRB.

Results

Faculty Respondents

The survey was distributed to all faculty at the University, numbering, in 2006, 1,474 full-time tenured, tenure-track, and non-tenure-track faculty. It was completed by 305 faculty members, yielding a response rate of 20.6%. This response rate is biased downward to the extent that it is unknown how many of the 1,474 faculty members had a research assignment significant enough to foster interest in the survey. If only about 1,000 faculty members had significant research assignments, the response rate would be around 30%. Regardless, a low response rate was not unexpected, given the survey's length. Yet, the majority of respondents (245 or 80%) chose the long version; 75% answered more than 75% of the rating items, and 274 answered at least one open-ended question. Compared with the total responses received from the college/institute level, business administration, education, and mental health attracted the highest response rate and medicine, the lowest. Of those who indicated their rank, 88 (35%) were assistant professors, 77 (30.5%), associate professors, and 87 (34.5%), full professors, producing even representation across ranks.

Faculty from 12 colleges responded to the survey. For ease of exposition and analysis, three clusters of related colleges were formed. Cluster 1 comprised colleges in the hard sciences and engineering, and included the colleges of arts and sciences, engineering, and marine sciences. Cluster 2 included the colleges of architecture, business, education, and visual and performing arts -- areas where grant-funded research played a relatively minor role given the limited number of funding sources in these fields. Cluster 3 comprised the health sciences and included the colleges of medicine, nursing, public health, mental health, and health sciences. For both Cluster 1 and Cluster 3, external, grant-funded research played a significant role. A considerable portion (over 80%) of the research funding from external grants for the University accrued to colleges comprising Cluster 3. Table 1 shows the distribution of respondents by rank across the three clusters. Some variation in proportion of faculty ranks occurred across colleges; however, using Chi-square analysis as a test of independence revealed that the proportions did not differ significantly across the three clusters ($\chi 2 = 27.17$, df=22, p=.205).

Table 1
Faculty Rank by College Group

Faculty rank	College group			Total
	Arts/sciences, Engineering, Marine Sciences	Architecture, Business, Education, Visual & Performing Arts	Medicine, Nursing, Public Health, Mental Health, Health Sciences	
Assistant professor	25	34	25	84
Associate professor	30	21	23	74
Full professor	33	19	32	84
Total	88	74	80	242

Importance Scales

Each of the eight categories of support questions included an "other" question that allowed respondents to add information not specifically addressed in the preceding (specific) questions. A majority of respondents left the "other" question blank. Excluding the "other" question in each category, reliability analyses were conducted on the importance ratings for the remaining questions to ascertain the degree of internal consistency as the basis for considering each category as a single construct. For seven of the eight categories, the Cronbach's alpha was above the benchmark of .70 for acceptable reliability (Nunnally, 1978). One category containing four questions dealing with administrative/academic support had a relatively low Cronbach's alpha coefficient of .60. Consequently, this category was excluded from further analyses. The remaining seven categories along with the Cronbach's alpha coefficients and the questions within each category are shown in Table 2; also provided are the frequencies of low, medium, and high responses for each scale item. Table 3 is a display of the correlations among the seven importance scales. As might be expected, the scales are highly and significantly correlated, with the correlations ranging from .222 to .593 ($p<.01$).

Table 2
Sources of Support for Research and Scholarship Activities: Importance Scales

	Low	Med	High	Total
Financial resources (Cronbach's α = .74; n=176)				
Project start up funds	15 (6.4%)	45 (19.3%)	173 (7.2%)	233
Bridge funds (between funded projects)	29 (14.1%)	65 (31.6%)	112 (54.4%)	206
Funds for research related travel	28 (11.8%)	96 (40.3%)	114 (47.9%)	238
Funds for graduate research assistants	20 (8.5%)	63 (26.8%)	152 (64.7%)	235
Funds for non-student research personnel	48 (22.2%)	88 (40.7%)	80 (37%)	216
Tuition waivers for student research personnel	21 (9.7%)	54 (24.9%)	142 (65.4%)	217
Material resources (Cronbach's α = .83; n=97)				
Laboratory space	13 (8.9%)	34 (23.3%)	99 (67.8%)	146
Non-lab space for conducting research, housing graduate assistants	21 (10.8%)	80 (41.2%)	93 (47.9%)	194
Laboratory equipment	15 (11.2%)	34 (25.4%)	85 (63.4%)	134
Computing equipment	8 (3.5%)	61 (26.9%)	158 (69.6%)	227
Communications equipment	20 (9.6%)	104 (50%)	84 (40.4%)	208
Research databases	14 (6.8%)	56 (27.1%)	137 (66.2%)	207
Scholarly journals/books (at main or other library)	9 (3.9%)	42 (18.2%)	180 (77.9%)	231
Human resources (Cronbach's α = .82; n=88)				
Research assistants	14 (6.5%)	54 (24.9%)	149 (68.7%)	217
Laboratory assistants	20 (18.2%)	35 (31.8%)	55 (50%)	110
Clerical/staff support (non-grant related)	23 (10.7%)	75 (34.9%)	117 (54.4%)	215
Clerical/staff support for grant related activities (pre-award and post-award)	12 (5.9%)	47 (23.3%)	143 (70.8%)	202
Statistical and/or other expert technical support	22 (11.2%)	53 (27%)	121 (61.7%)	196
Librarian who can help with research	49 (23.4%)	79 (37.8%)	81 (38.8%)	209
Intellectual/scholarly resources (Cronbach's α = .88; n=102)				
Formally assigned research mentor in your unit or college	62 (30.4%)	65 (31.9%)	77 (37.7%)	204
Research mentor in your unit or college not formally assigned	48 (23.9%)	60 (29.9%)	93 (46.3%)	201
Research mentor in your field for help with research problems	36 (17.4%)	58 (28%)	113 (54.6%)	207

Table 2 (continued)
Sources of Support for Research and Scholarship Activities: Importance Scales

	Low	*Med*	*High*	*Total*
Research-active peers in department/unit	15 (6.6%)	44 (19.5%)	167 (73.9%)	226
Research workshop/seminar series in department/unit	40 (17.9%)	82 (36.8%)	101 (45.3%)	223
Structured support for advancing your research ideas	39 (17.6%)	80 (36.2%)	102 (46.2%)	221
Cross-campus and cross-department communications & opportunities	27 (12.1%)	93 (41.5%)	104 (46.4%)	224
Protection and commercialization of intellectual property	30 (24%)	49 (39.2%)	46 (36.8%)	125
Web-based resources for supporting intellectual/scholarly activities	15 (6.9%)	59 (27.2%)	143 (65.9%)	217
General intellectual/scholarly climate	9 (3.9%)	33 (14.3%)	188 (81.7%)	230
Pre-award grant support (Cronbach's α = .83; n=167)				
Assistance with identification of funding opportunities	23 (10.6%)	93 (42.9%)	101 (46.5%)	217
Assistance with grant-related budget issues	16 (7.7%)	56 (26.9%)	136 (65.4%)	208
Assistance with completing grant application forms	22 (10.6%)	65 (31.3%)	121 (58.2%)	208
Processing submission of grants	13 (6.3%0	47 (22.9)	145 (70.7%)	205
Web-based resources for supporting pre-award activities	11 (6.3%)	81 (46.3%)	83 (47.4%)	175
Post-award grant support (Cronbach's α = .85; n=138)				
Review and negotiation of contracts and grants	14 (8.5%)	51 (31.1%)	99 (60.4%)	164
Disbursement of funds	6 (3.4%)	43 (24.6%)	126 (72%)	175
Financial management of grant	9 (5.2%)	38 (21.8%)	127 (73%)	174
Web-based resources for supporting post-award activities	16 (10.7%)	67 (44.7%)	67 (44.7%)	150
Research integrity and compliance (Cronbach's α = .85; n=88)				
Support for compliance with safety and security rules	10 (10.3%)	36 (37.1%)	51 (52.6%)	97
Completing grant compliance/reporting forms, etc.	9 (5.4%)	79 (47.3%)	79 (47.3%)	167
Clarity of research policies, procedures, and guidelines	11 (5.6%)	69 (35.4%)	115 (59%)	195
Channels for information regarding research integrity or compliance	14 (7.4%)	74 (39.4%)	100 (53.2%)	188

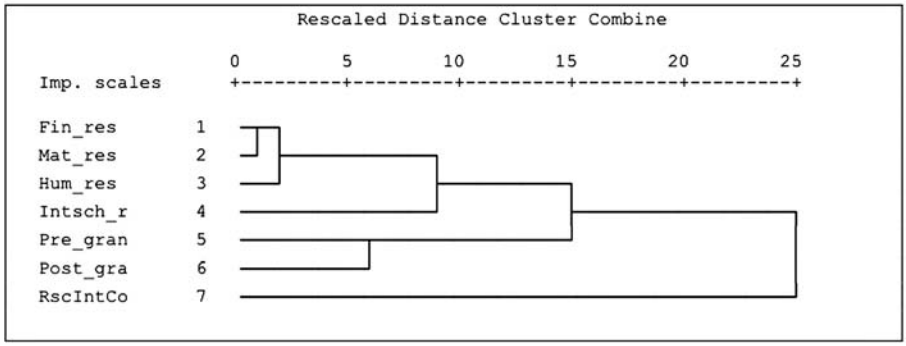
Table 3
Correlations among Importance Scales

		Importance of financial resources	Importance of material resources	Importance of human resources	Importance of intellectual/ scholarly resources	Importance of pre-award grant support	Importance of post-award grant support	Importance of research integrity/ compliance support
Importance of financial resources	Pearson Correlation	1	.593(**)	.527(**)	.504(**)	.276(**)	.380(**)	.222(**)
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.002
	N	242	235	229	232	218	180	201
Importance of material resources	Pearson Correlation	.593(**)	1	.579(**)	.500(**)	.315(**)	.384(**)	.325(**)
	Sig. (2-tailed)	.000		.000	.000	.000	.000	.000
	N	235	237	228	232	218	181	202
Importance of human resources	Pearson Correlation	.527(**)	.579(**)	1	.571(**)	.516(**)	.493(**)	.367(**)
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000
	N	229	228	229	229	215	178	199
Importance of intellectual/scholarly resources	Pearson Correlation	.504(**)	.500(**)	.571(**)	1	.525(**)	.505(**)	.453(**)
	Sig. (2-tailed)	.000	.000	.000		.000	.000	.000
	N	232	232	229	233	219	181	202
Importance of pre-award grant support	Pearson Correlation	.276(**)	.315(**)	.516(**)	.525(**)	1	.635(**)	.532(**)
	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000
	N	218	218	215	219	219	181	200
Importance of post-award grant support	Pearson Correlation	.380(**)	.384(**)	.493(**)	.505(**)	.635(**)	1	.424(**)
	Sig. (2-tailed)	.000	.000	.000	.000	.000		.000
	N	180	181	178	181	181	181	171
Importance of research integrity/compliance support	Pearson Correlation	.222(**)	.325(**)	.367(**)	.453(**)	.532(**)	.424(**)	1
	Sig. (2-tailed)	.002	.000	.000	.000	.000	.000	
	N	201	202	199	202	200	171	202

** Correlation is significant at the 0.01 level (2-tailed).

Hierarchical cluster analysis was employed to identify clusters of relatively homogeneous importance scales. This procedure is aimed at partitioning the data into relatively homogeneous clusters so that scales that are similar are grouped together. The procedure uses an algorithm that starts with each variable (importance scale in our data set) in a separate cluster and combines clusters until only one is left. Depicted in Figure 1 is a dendrogram plotted to facilitate the identification of related clusters. A dendrogram is a visual representation of the steps in a hierarchical clustering solution that shows the clusters being combined and the values of the distance coefficients at each step with connected vertical lines designating similar variables. The dendrogram is interpreted to mean that financial and material resources are most alike, with human resources following closely in similarity. As is logical, pre-grant and post-grant support are clustered together. Intellectual and scholarly resources, and research integrity and compliance support, are two research resource dimensions that tend to stand alone.

Figure 1
Dendrogram Showing Linkages across Importance Scales



Fin_res = Importance of financial resources
Mat_res = Importance of material resources
Hum_res = Importance of human resources
Intsch_r = Importance of intellectual/scholarly resources
Pre_gran = Importance of pre-award grant support
Post_gra = Importance of post-award grant support
RscIntCo = Importance of research integrity/compliance support

The degree to which the importance scale ratings varied by college group was then investigated. As shown in Table 4, little variation exists in the degree of importance ascribed to each scale as a function of the college group to which the respondent belongs. Since the importance scales were significantly correlated, multivariate analysis of variance (MANOVA) was employed to investigate whether the scales differed between college groups. MANOVA results revealed an insignificant difference in importance scale ratings among college groups (Wilks' $\lambda = 1.26$, df=14, p=.232).

Table 4
Importance Ratings by College Group

Scales[+]	College group	Mean[@]	Std. Dev.	N
Importance of financial resources	Arts/sciences, Engineering, Marine Sciences	2.54	.392	64
	Architecture, Business, Education, Visual & Performing Arts	2.40	.489	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.42	.480	64
	Total	2.46	.453	158
Importance of material resources	Arts/sciences, Engineering, Marine Sciences	2.60	.404	64
	Architecture, Business, Education, Visual & Performing Arts	2.41	.420	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.57	.464	64
	Total	2.55	.436	158
Importance of human resources	Arts/sciences, Engineering, Marine Sciences	2.53	.448	64
	Architecture, Business, Education, Visual & Performing Arts	2.41	.358	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.53	.495	64
	Total	2.51	.452	158
Importance of intellectual/scholarly resources	Arts/sciences, Engineering, Marine Sciences	2.36	.483	64
	Architecture, Business, Education, Visual & Performing Arts	2.36	.446	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.43	.497	64
	Total	2.39	.481	158
Importance of pre-award grant support	Arts/sciences, Engineering, Marine Sciences	2.56	.457	64
	Architecture, Business, Education, Visual & Performing Arts	2.43	.476	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.56	.465	64
	Total	2.53	.464	158
Importance of post-award grant support	Arts/sciences, Engineering, Marine Sciences	2.67	.474	64
	Architecture, Business, Education, Visual & Performing Arts	2.53	.505	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.55	.508	64
	Total	2.60	.495	158

Table 4 (Continued)
Importance Ratings by College Group

Scales[+]	College group	Mean[@]	Std. Dev.	N
Importance of research integrity/compliance support	Arts/sciences, Engineering, Marine Sciences	2.40	.561	64
	Architecture, Business, Education, Visual & Performing Arts	2.39	.652	30
	Medicine, Nursing, Public Health, Mental Health, Health Sciences	2.50	.471	64
	Total	2.44	.544	158

[+]Refer to Table 2 for the components of each importance scale
[@]Importance rating scale: 1=low; 2=medium; 3=high

It is reasonable to expect that the ratings of the importance of research support resources might vary as a function of the respondent's faculty rank. Specifically, junior untenured faculty who must produce sufficient high quality research to obtain tenure and promotion might be expected to have different research support needs in contrast to senior full professors who might potentially be less research active. Table 5 specifies how the ratings for each importance scale varied by faculty rank. As shown in Panel A of Table 6, MANOVA results revealed a significant difference in importance scale ratings among faculty ranks (Wilks' $\lambda = 1.898$, df=14, p=.026). Panel B of Table 6 reveals that importance of intellectual and scholarly resources, and the importance of research integrity and compliance support, were the two scales for which the importance ratings differed significantly among assistant professors, associate professors, and full professors. The means in Table 5 indicate that both of these scales were rated higher by assistant professors relative to associate and full professors. It is especially revealing that junior faculty (assistant professors) rated the importance of intellectual and scholarly resources significantly higher than senior faculty (associate and full professors). In the early stages of their research career, they apparently feel a greater need for those resources relative to senior faculty who likely have established programs of research.

Table 5
Importance Ratings by Faculty Rank

Importance scale	Rank	Mean	Std. Dev.	N
Importance of financial resources	Assistant	2.41	.464	44
	Associate	2.55	.478	40
	Full	2.41	.458	65
	Total	2.45	.466	149
Importance of material resources	Assistant	2.53	.455	44
	Associate	2.59	.473	40
	Full	2.51	.429	65
	Total	2.54	.447	149
Importance of human resources	Assistant	2.49	.473	44
	Associate	2.54	.489	40
	Full	2.46	.474	65
	Total	2.49	.475	149
Importance of intellectual/scholarly resources	Assistant	2.50	.467	44
	Associate	2.44	.437	40
	Full	2.25	.495	65
	Total	2.38	.482	149
Importance of pre-award grant support	Assistant	2.65	.412	44
	Associate	2.45	.557	40
	Full	2.51	.436	65
	Total	2.53	.469	149
Importance of post-award grant support	Assistant	2.56	.562	44
	Associate	2.58	.481	40
	Full	2.59	.497	65
	Total	2.58	.510	149
Importance of research integrity/compliance support	Assistant	2.57	.509	44
	Associate	2.40	.571	40
	Full	2.34	.531	65
	Total	2.43	.541	149

Table 6
Comparing Importance Ratings by Faculty Rank

Panel A: Multivariate tests

Effect		Value	F	Hypothesis df	Error df	Sig.
Intercept	Pillai's Trace	.980	971.629(a)	7	140	.000
	Wilks' Lambda	.020	971.629(a)	7	140	.000
	Hotelling's Trace	48.581	971.629(a)	7	140	.000
	Roy's Largest Root	48.581	971.629(a)	7	140	.000
Faculty rank	Pillai's Trace	.172	1.897	14	282	.027
	Wilks' Lambda	.834	1.898(a)	14	280	.026
	Hotelling's Trace	.191	1.899	14	278	.026
	Roy's Largest Root	.136	2.740(b)	7	141	.011

a Exact statistic
b The statistic is an upper bound on F that yields a lower bound on the significance level.

Panel B: Tests of between-subjects effects

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Faculty rank	Importance of financial resources	.512(a)	2	.256	1.184	.309
	Importance of material resources	.163(b)	2	.082	.405	.668
	Importance of human resources	.154(c)	2	.077	.338	.713
	Importance of intellectual/scholarly resources	1.957(d)	2	.978	4.396	.014
	Importance of pre-award grant support	.901(e)	2	.451	2.076	.129
	Importance of post-award grant support	.034(f)	2	.017	.065	.937
	Importance of research integrity/compliance support	1.455(g)	2	.727	2.535	.083

a R Squared = .016 (Adjusted R Squared = .002)
b R Squared = .006 (Adjusted R Squared = -.008)
c R Squared = .005 (Adjusted R Squared = -.009)
d R Squared = .057 (Adjusted R Squared = .044)
e R Squared = .028 (Adjusted R Squared = .014)
f R Squared = .001 (Adjusted R Squared = -.013)
g R Squared = .034 (Adjusted R Squared = .020)

Support for Research

Turning to the views of respondents regarding the actual level of support received at the University, the results suggest considerable room for improvement. Faculty consistently rated support in the medium to low range, although variations occurred by unit and rank. Key problem areas included research assistants, post-award grant administration, project support, bureaucratic infrastructure, and intellectual climate. Because the purpose of the survey was problem seeking regarding individual support for research, the findings consistently reflect problem-oriented responses.

Going beyond the data to comprehend the inherent messages, we have not only identified concrete issues but also framed them in a larger strategic understanding of the areas of change that university leaders in similar situations might address. The themes identified, both quantitatively and qualitatively, proved consistent across the range of items for specific sections. We now discuss these themes, identifying each major theme in italics. *Time* referred to the adjustment of responsibilities for faculty that would permit more research, as well as support and relief from the burden of corollary tasks. *Funding* underscored additional or reallocated resources for specific needs. *Communication* was situated as collegial, intra- and interdepartmental. Parity was emphasized as a need with respect to fair access to resources and rewards. More specifically, infrastructure deficiencies were identified as the most salient issue (169/274 or 62% of faculty respondents); monetary resources, the second (147/274, 54%); and lack of time, the third (142/274, 52%).

Regarding University infrastructure, *bureaucratic systems* were identified as a source of grave concern. They were reported to impede research and inter-unit

collaboration, perpetuate inefficient and error-prone financial systems, and produce ancillary research functions often experienced as rigid, complicated, or suboptimal (e.g., IRB, patents/licensing). The faculty logged many complaints concerning the bureaucratic "red tape" involved in processing research-related forms and in attempting to secure help with the grant process. Post-award policies also received attention. Obtaining approved grant funding, a process described as "very difficult," occurred in a research setting characterized by mechanisms that often proved slow, outmoded, and ineffective. In addition to infrastructure deficiency, *policies and procedures* were described as cumbersome and redundant, time consuming, fragmented, and unfriendly to users. Simplification and streamlining were requested. An outlier perceived the infrastructure and grant support to be "an adequate financial structure that aids instead of hinders research."

Three principal areas of personnel and general support were noted. First, *personnel support* resulted in a call for more clerical support across the University. Participants argued that a high level of bureaucracy in the absence of support personnel diverted effort and reduced faculty research potential. Second, *graduate/ research assistantship support*, described as an intellectual labor force that assists with research/scholarship tasks, was seen as lacking, given that doctoral students, research assistants, and graduate assistants were underpaid and often inadequately prepared for working in a research environment. It was believed that the University desperately needed greater recruiting of these individuals and doctoral students in general. Third, *general support*, portrayed as unevenly or unfairly distributed assistance, was associated with impoverished incentives and rewards for research, and with little feeling of general or targeted support from the institution. A notable area in which support was lacking centered on scheduling of teaching responsibilities, with indications from some faculty that their heavy teaching load prohibited them from doing much research. Too many different curricula and the necessity of teaching during summers interfered with the goals of a rapidly growing research institution.

Collaboration and training targeted collegial/intellectual collaboration and support. Faculty described *collaboration* across the University as generally at a low level, and culture and structure as unsupportive of team efforts. The culture of the institution was not seen as conducive to faculty participation in research-oriented collaboration, mentoring, or even conversation. Some faculty acknowledged that while research skills were not their forte, they nonetheless desired to learn these but needed the support of mentors. Mentors who helped budding scholars with their research were seen as rare, and department chairs were considered infrequently supportive of faculty's research in their unit. One can infer that the faculty we surveyed desired collaboration and participation in knowledge communities that actively supported research efforts. Research training in support of methodological analyses was identified as a definite need, particularly in areas such as grant preparation and submission, and in all areas involving funded research.

Material resources were comprised of three areas, with these primary results: (a) space was associated with limitations in research space and laboratory and other general facilities, resulting in restrictions on research productivity; (b) technology/ equipment was commonly viewed as lacking, outdated, or broken; and (c) library

holdings were seen as deficient, with specific needs for more up-to-date materials, expanded subscriptions, and improved access to electronic databases.

Generally, the University's research support infrastructure was characterized as outmoded and unresponsive to the needs of today's researchers. The support structures and communications that enabled faculty to perform to their fullest capacity as researchers simply did not exist to the extent desired. Another perceived barrier to research was *monetary resources*, referred to as non-existent (and/or a paucity of) start-up funds for research or a dearth of grant opportunities, sometimes known as "seed" monies. Grant-funded faculty described continuous funding as limited, along with funds for equipment, clerical staff, statistical aids, and database/ library materials.

The survey was used to solicit a representative response to a lengthy instrument. This implies that the faculty viewed their own research capacity and effectiveness as important and that they had vital messages to send. Based on the quantitative data collected and analyzed, the mean support ratings were in the medium to low range, which suggests that significant room for improvement exists in all research support areas. General university-wide themes underlie variations in specific areas across units, ranks, and other groups.

The following were all critical areas identified via faculty ratings: increasing the availability of research assistants; strengthening post-award administration; providing sufficient material resources for laboratory space and equipment for initiating and maintaining specific research capacities; making resources more available and facilitating scholarship, especially for newer or more inexperienced faculty; expanding space and equipment in the sciences; and providing clerical support for optimizing investment of faculty effort.

Self-rating of Scholarly Output

Respondents were asked to rate their own research and scholarly output over the last 3 years relative to standards/norms (a) they held for themselves, (b) within their department/unit at the University, and (c) at peer "Research I" institutions. The ratings were made on a scale of low, medium, and high. The self-ratings are shown in Table 7, organized by faculty rank. Panel A shows the ratings relative to standards the respondents held for themselves, panel B indicates those relative to department standards, and panel C specifies the ratings relative to standards at peer research institutions. For all three rating categories, Chi-square analyses revealed a significant difference among faculty ranks in their self-ratings on the low to high scale. Senior faculty (associate and full professors) tended to rate themselves much higher relative to junior faculty (assistant professors). Based on this finding, we speculate that the more senior faculty have significant research accomplishments, certainly enough to warrant tenure, whereas the junior faculty likely have accomplished less and consequently rated themselves lower.

Table 7
Rating of Research/Scholarly Output, by Faculty Rank

Panel A: Ratings relative to self standards

Faculty rank	Low	Medium	High	Total
Assistant professor	20	42	25	87
Associate professor	11	41	25	77
Full professor	10	26	49	85
Total	41	109	99	249

$\chi^2 = 19.50$, df=4, p<.01

Panel B: Ratings relative to department standards

Faculty rank	Low	Medium	High	Total
Assistant professor	14	29	42	85
Associate professor	4	29	44	77
Full professor	6	18	61	85
Total	24	76	147	247

$\chi^2 = 13.94$, df=4, p<.01

Panel C: Ratings relative to peer institution standards

Faculty rank	Low	Medium	High	Total
Assistant professor	25	38	22	85
Associate professor	18	37	22	77
Full professor	15	24	45	84
Total	58	99	89	246

$\chi^2 = 17.57$, df=4, p<.01

Recent Scholarly Activity

As an indication of their research proclivity, respondents were prompted to indicate which of several research and scholarly activities they had undertaken in the last three years. They were asked whether they had applied for and obtained external as well as internal grants for research, published in refereed and non-refereed academic journals and published other types of documents (e.g., research reports, chapters in scholarly books), and made presentations at professional conferences or elsewhere. Engagement in each of these activities was analyzed by faculty rank. The results for a selected subset of activities are shown in Table 8, panel A through E. Chi-square analyses employed to test for independence in the proportion of activities by faculty rank reveal a consistent pattern-senior faculty respondents, especially full professors, were significantly more likely to have engaged in the aforementioned activities.

Table 8
Recent Scholarly Activity, by Faculty Rank

Panel A: Applied for external grants for research

Faculty rank	Not done	Done	Total
Assistant professor	28	58	86
Associate professor	22	55	77
Full professor	8	77	85
Total	58	190	248

$\chi^2 = 14.46$, df=2, p<.01

Panel B: Obtained external grants for research

Faculty rank	Not done	Done	Total
Assistant professor	54	32	86
Associate professor	33	44	77
Full professor	21	64	85
Total	108	140	248

$\chi^2 = 25.24$, df=2, p<.01

Panel C: Publication in refereed academic journals

Faculty rank	Not done	Done	Total
Assistant professor	14	72	86
Associate professor	3	74	77
Full professor	4	81	85
Total	21	227	248

$\chi^2 = 10.40$, df=2, p<.01

Panel D: Publication of research monographs/reports

Faculty rank	Not done	Done	Total
Assistant professor	69	17	86
Associate professor	54	23	77
Full professor	33	52	85
Total	156	92	248

$\chi^2 = 33.91$, df=2, p<.01

Panel E: Publication of scholarly books/chapters

Faculty rank	Not done	Done	Total
Assistant professor	55	31	86
Associate professor	33	44	77
Full professor	17	68	85
Total	105	143	248

$\chi^2 = 33.84$, df=2, p<.01

Preferences for Research Incentives

Respondents were asked to indicate their level of agreement on a five-point Likert scale pertaining to each of eight methods of providing incentives to faculty for enhancing research productivity at the University. The methods can be grouped

into two broad categories: (1) recognition for outstanding research productivity through research awards, and (2) financial incentives for grant activity or exceptional research accomplishments. Financial incentives included items such as a stipend or bonus for obtaining an external grant, generating salary savings for the institution (by putting a portion of the researcher's salary on the external grant), and attaining exceptional scholarly accomplishments (e.g., publishing in a premier journal). Results are displayed in Table 9. Close to half of the respondents (46%) favored recognition through awards and all types of financial incentives. Almost one-third (28%) expressed a preference for recognition through awards and financial incentives for exceptional scholarly activity but not specifically for obtaining grants. Approximately a quarter of the respondents (26%) favored financial incentives only.

Table 9
Preferences for Research Incentives

Preference Group	*N*	*%*
Favor recognition and all incentives: financial (salary, bonus, research expenses)	121	46%
Favor recognition as well as financial incentives for scholarly achievement, not grants	74	28%
Favor financial incentives only	68	26%

Conclusions and Implications

Faculty members at a major research-extensive university in the U.S. were surveyed to elicit their perceptions of the importance of various factors for supporting their research and scholarship activities. The survey grouped support factors into these categories: financial resources, material resources, human resources, intellectual/scholarly resources, administrative/academic support, pre- and post-award grant support, and support for research integrity and compliance issues. Results revealed that financial and material resources were deemed critical for supporting faculty's research efforts. Availability of sufficient laboratory space and equipment was deemed extremely important by faculty in engineering and the hard sciences. Intellectual and scholarly resources, such as the availability of research mentors and research-active peers, were considered significantly more important by junior faculty than senior faculty.

Although not reported herein quantitatively, the instrument also elicited faculty respondents' perceptions regarding the level of support for research received. A somewhat bleak picture was painted. While university administrators chant the mantra of interdisciplinary research, many of the faculty we surveyed felt cut off from other professors. In response to open-ended questions, some faculty members indicated that the lack of communication and collaboration interfered with the interdisciplinary goals of research. Lessons learned from the current undertaking also suggest that university infrastructure and organizational culture function as two complementary change structures. Infrastructure can work better with a "can-do" attitude and systems that do not impede faculty. Culture change can occur not only in support structures but also in faculty cultures. Reward systems can help to some

extent, but it seems even more important that faculty learn to work together and that they are enabled to do so.

We recognize that this study has certain limitations. Despite multiple requests of faculty to complete the survey, we were successful in obtaining only about a 21% response rate. While low, the response rate was deemed sufficient to allow meaningful conclusions to be drawn. It is unknown whether the views of non-respondents differ systematically. By design, the survey had a "problem orientation." Because faculty members were not explicitly asked to identify positive features or solutions to their problems, few volunteered such information. Finally, the principal investigators did not seek to identify the specific sources of support but simply asked respondents to indicate the level being received, regardless of the source.

Our faculty survey can be used by other higher education leaders also interested in identifying deficiencies in the level of support for research and scholarly activities that may need remedying. Conversations across the faculty-administrator divide are what Wheatley (2002) recommends as a crucial starting place for organizational change. To the extent that obstacles to research are mitigated or overcome at research institutions globally, humankind's pursuit of knowledge can proceed relatively unimpeded.

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