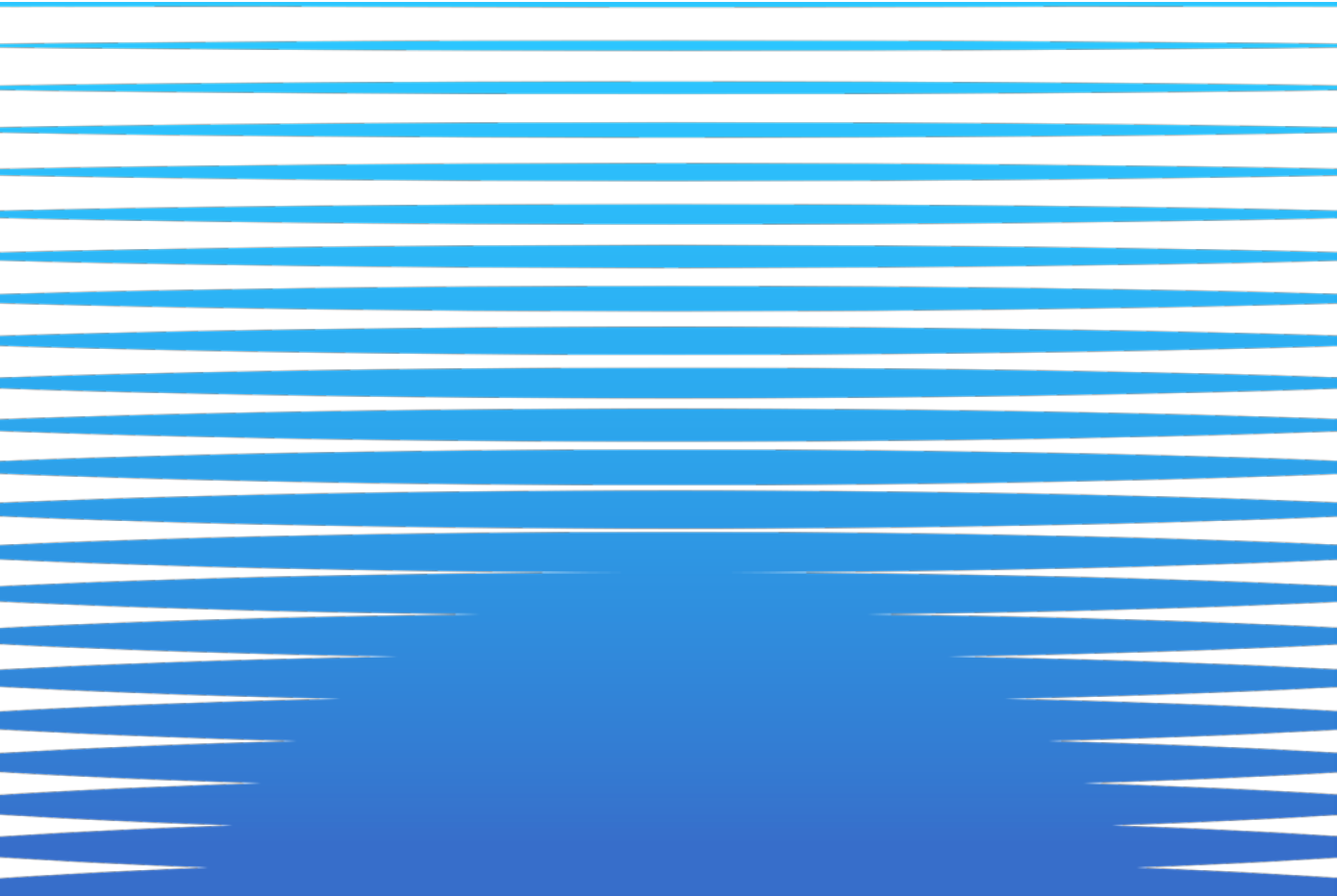# The Senior Research Officer

Experience, Role, Organizational Structure, Strategic Directions, and Challenges

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ITHAKA S+R

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Executive Summary

The senior research officer is an extremely important position at major research universities, playing a principal leadership role for what is typically a vast research enterprise. To examine the role within these institutions, we interviewed 44 incumbents at US research universities during summer and early fall 2020. Our key findings include:

- *Many research offices have grown substantially but there is considerable institutional variation.* University-wide research offices are now the norm, and there is a pull to increasingly centralize a variety of administrative services and enablement functions. There are some common approaches to organizing research offices but for every possible pattern we found exceptions.

- *There are two basic models for the senior research officer role.* In a "professional model," the individual has taken on administrative roles of progressively greater responsibility and rarely continues to conduct their own research. In a "service model," the individual sees themselves as a faculty member and university citizen first and foremost, continues to lead their own research, and plans to return eventually to the faculty.

- *Research revenue and research competitiveness are vital strategic priorities.* Virtually all interviewees emphasized the importance of grant revenue and fundraising—some see themselves as the "chief revenue officer," responsible for an enormous portion of the university budget. Virtually all interviewees prioritize their institution's research competitiveness, as reflected in grants awarded and faculty recruitment/retention. And, many are personally involved in shaping large-scale collaborations of high monetary value either within their institution or in some cases with outside partners.

- *Research support is seen as a major competitive edge and is often a management challenge.* Many interviewees spoke about investments in core research facilities as an important vehicle to attract and retain associated talent. At the same time, supporting these facilities require extensive subsidies. No interviewee reported a coherent institutional strategy connecting all elements of research support and enablement.

- *Growing tensions with China have produced a spike in compliance work and concerns about talent flows.* Nearly every interviewee is devoting growing bandwidth and increasing staffing to address research security, foreign influence, and export controls. Many are concerned about the impact of these tensions on talent migration, both for scholars and graduate students.

The senior research officer oversees an increasingly complex set of responsibilities. At the end of the report, we offer some reflections about how this role may change in the future and some of its possible implications for the structure of the research university more broadly.

Introduction

The research enterprise continues to grow more complex, competitive, interdisciplinary, and interinstitutional. Although academic research often is conducted in a distributed and grassroots manner, the senior research officer (SRO) plays an increasingly central and unifying role in stewarding research activities and shaping institutional policies and strategies. The SRO—who often holds the title of vice president, vice provost, or vice chancellor for research— typically holds responsibilities including overseeing external funding, institutional research safety and compliance, core research facilities, and research ethics and integrity. In this project, we examine the role and strategic priorities of the SRO at the largest US research universities.

Research Goals and Methodology

Research—an enormous part of the mission of many large universities—generates substantial revenue and impact, but also risk. In investigating the roles and priorities of leaders who steward the research enterprise, we seek to understand how the technical and social research infrastructure is changing broadly. In doing so, we aim to provide research leaders and those who work with them a sense of how the senior research officer role is evolving nationally. We also hope that this study will expand the understanding of key strategic priorities, including revenue and fundraising, research impact maximization, research support services, and new compliance requirements.

We began this project with a literature review and an analysis of SRO job descriptions, organizational charts, and job postings.[1] We subsequently interviewed 44 SROs between August and October 2020. We intentionally examined institutions with robust research agendas, focusing on those with the highest levels of research activity and concentration. To do so, we restricted our sample almost entirely to R1 institutions, within which we oversampled Association of American Universities (AAU) members. Many members of the Association of Public and Land-grant Universities (APLU) are included in our sample.[2] In our sampling, we strived to maintain diversity by including both public and private universities from different states and of varying institutional size. We conducted outreach mostly by asking the director of the university's library to provide an introduction to the senior research officer for purposes of conducting the interview, and we do not believe this approach introduced meaningful bias into the interviews conducted. Of the 64 requests, we received only seven outright declines, and 44 interviews were ultimately completed. We believe the interviewees, listed in the Acknowledgments, provide a strong representation of the largest research universities. For comparative purposes, we also interviewed a few senior research officers from somewhat smaller institutions.

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[1] Our initial analysis was based on an examination of the university websites of 120 research universities (representing AAU and APLU members) to identify organizational charts and senior research officer information, such as job descriptions, biographies, and appointment announcements. We also searched for new senior research officer job postings.

[2] The R1 institutions are the doctoral universities with the most extensive research enterprises, according to the Carnegie Classification.

The semi-structured interview format allowed us to explore issues unique to individual research institutions. We aimed to understand different points of view so that we can provide an empirical snapshot of the insights, perceptions, and experiences of those interviewed rather than striving for generalizability. The interview guide (included in the Appendix) covered trends in research support services and resources, internal and external collaborations, research information management activities, and priorities and challenges. We committed to our interviewees that we would not link their identities with individual responses in this report, in order to enable them to be as candid as possible.

The project was conceptualized prior to the outset of the pandemic and interviews were delayed somewhat because of it. Most interviews were conducted as the subjects were preparing to support a new academic year that promised to be unconventional and unpredictable. After overseeing the shutdown of the labs, the interviewees were busy ensuring a safe return to normal operations and some had taken on the role of establishing testing centers for students, staff, and faculty. We recognize the considerable impact and consequences of COVID-19 on the research enterprise.[3] In this project, we had a unique opportunity to explore broader structural issues and strategic directions, including those that will continue after the pandemic. In explaining this decision to interviewees, quite a number of them expressed relief to have a small break in their day from talking about and working on the pandemic's disruptions.

Literature Review

In 2013, the Research Universities Future Consortium conducted research to identify the concerns and common barriers that limit the success of US research universities and reported that research universities were moving into a new phase of limited resources, greater levels of accountability and assessment, and higher performance expectations.[4] In addition, the increasing compliance and reporting requirements required a new administrative structure as universities were experiencing increasing scrutiny of their expenses, value, and political and public confidence in the value of university-based research. One of the conclusions of the study was that the leadership and staffing requirements, competencies, and professionalization of research administration was poorly understood and underappreciated within the university community and by funding organizations.

Compared to other academic senior leadership positions, the SRO is relatively new within higher education and emerged as an important senior leadership role in the later 1990s in response to the growing bureaucracy and administrative overhead associated with conducting research.[5] In most cases, the SRO reports directly to the president of the university, seldom to the provost.

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[3] See Jane Radecki and Roger C. Schonfeld, "The Impacts of COVID-19 on the Research Enterprise: A Landscape Review," Ithaka S+R, October 26, 2020, https://doi.org/10.18665/sr.314247.

[4] Research Universities Futures Consortium, "The Current Health and Future Well-Being of the American Research University," June 2012, https://www.elsevier.com/research-intelligence/resource-library/the-current-health-and-future-well-being-of-the-american-research-university.

[5] Julie A. Nash and Diane A. Wright, "Profile of the Chief Research Officer at Major Research Universities in the United States and Examination of the Current Pathways to the Position, *Journal of Research Administration* 44, no. 2 (2013), https://eric.ed.gov/?id=EJ1156072.

Although a vast amount has been written about various aspects of the research enterprise, there are only a handful of related materials that shed light on the leadership aspects of the research and creative activity enterprise.[6] The most relevant and prominent study on SROs was conducted by Kelvin K. Droegemeier and his colleagues in 2013 to examine the skills and knowledge required to successfully serve as a SRO.[7] The study was based on an online survey, completed by 78 SROs from APLU members, about the academic and experiential pathways of respondents, their current roles and responsibilities, and future challenges. The majority of survey respondents indicated that they received little direct training for the position. The authors highlighted the lack of diversity as SROs—most were male and white, and 87 percent came from various science fields, holding advanced degrees particularly in engineering, biomedical science, or physical science.

In another related study, also from 2013, Julie A. Nash and Diane A. Wright implemented a survey and conducted an analysis of resumes and job descriptions to profile SROs at major US research universities and examine the pathways to the position. They concluded that while SRO job descriptions highlighted the leadership skills and business acumen necessary for success, the incumbent SROs cited their experience in research and teaching as the most helpful attributes in preparing them for the position.[8] Most had held faculty positions and served in departmental administration roles before becoming SROs.

About the Senior Research Officer

Every large research university has a senior research officer, typically a scientist who is an accomplished researcher. At the same time, organizational structures vary, and there is not a standard way to organize or fill the role of senior research officer.

Career Paths and Requirements

The backgrounds of the individuals serving as senior research officers at large research universities have much in common. At the highest level, nearly all have science backgrounds, and most are highly accomplished researchers in their own right. In addition, there is a remarkable lack of diversity in these positions: An analysis of all SROs of the AAU and APLU member institutions indicates that about 25 percent of the incumbents are women, which matches our interviewees.

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[6] This is one of the few write-ups we were able to identify: Mark A. Barteau, "Commentary: Thinking About Becoming a VPR?" *Physics Today*, January 1, 2019, https://physicstoday.scitation.org/doi/10.1063/PT.3.4103.

[7] Kelvin K. Droegemeier, Lori Anderson Snyder, Alicia Knoedler, William Taylor, Brett Litwiller, Caroline Whitacre, Howard Gobstein, Christine Keller, Teri Lyn Hinds, and Nathalie Dwyer, "The Roles of Chief Research Officers at American Research Universities: A Current Profile and Challenges for the Future," *Journal of Research Administration* 48, no. 1 (2017): https://eric.ed.gov/?id=EJ1152287. Research was conducted in 2013, although published in 2017.

[8] Julie A. Nash and Diane A. Wright, "Profile of the Chief Research Officer at Major Research Universities in the United States and Examination of the Current Pathways to the Position, *Journal of Research Administration* 44, no. 2 (2013), https://eric.ed.gov/?id=EJ1156072.

Our interviewees were split between whether they saw themselves as professional academic administrators or faculty members in a "service" role, and while the distinction between these two models is not always hard and fast, it was clear enough in most of our interviews.

- Of those who fell into the former category, which we term the "professional model," many had taken on administrative roles of progressive responsibility (department chair, dean, director of a research institute, etc.), often moving between universities to do so, and several voiced interest in one day considering a provost or president role. Others had experience outside academic institutions, for example in a leadership role at a funding agency or defense research enterprise. Those in this category tended to see the role as having significant internal and external leadership components and revenue responsibilities. They rarely continue to conduct their own program of research once they assume this position.

- Those interviewees who fell into the other category, which we term the "service model," saw themselves as faculty members first and foremost, and typically had been associated with their university for a substantial portion of their career. They were lured into the role as a way to give service to their university. They maintain their own research agenda even while serving in this role and expressed every hope of returning to the faculty rather than taking on another tour of duty as an academic administrator. In this latter category, interviewees typically expressed the importance of bringing a faculty perspective to the role. The "service model" was captured well by one interviewee, "It is absolutely important to remain a researcher and report to the faculty, although formally I am reporting to the president." Another similarly explained, "I did not begin my science career with an intention of being a VPR one day. You asked me why am I doing this? To provide a faculty voice to the administration."

Many of our interviewees spoke about what attracted them to the SRO position. One said, "Research is the most fun but this kind of work is most rewarding. The nature of the job is you get to do a lot of different things." Another SRO said that they used to call themself an accidental administrator, originally having had no intentions of becoming a senior academic leader. Then they added, "what enthuses me is to show individuals and the organization what they are capable of, raising their sights and making things happen." Several mentioned the satisfaction of reducing barriers so that researchers can be successful, enabling them to grow and realize their aspirations. One interviewee commented, "It is a good place to enable things, it gives me satisfaction to bring teams together and I like being an enabler behind the scenes." Many approach the position from the perspective of faculty development and faculty support such as helping junior faculty members with new projects and catalyzing new initiatives. Some mentioned that the role of economic development, tech transfer, and innovation was quite appealing as they work with state and federal legislators and also advocate for funding in Washington DC.

According to Nash and Wright, SROs see strategic planning and critical thinking skills to be essential for the role, along with the ability to understand university culture, influence

stakeholders, and gain credibility in the eyes of faculty.[9] We did not ask specific questions about our interviewees' skill sets but heard comments that underscored the importance of these skills and values. Many SROs added that they needed to attend to both personal and organizational development and how they saw interpersonal and people skills as essential in their work. "I have to deal with a lot of interpersonal things. Some people like what you do, some criticize you. You cannot be a sensitive individual in this role." Their characterization of the position requirements highlighted the importance of having a holistic institutional perspective, a broad understanding of different branches of science, and an appreciation for the value of the academic research enterprise and its contributions to the society.

We analyzed the job descriptions of senior research officers, which highlight the importance of several common qualifications:

- Track record as a researcher and understanding of the diverse needs of scholars' multidisciplinary research initiatives;
- Knowledge of national and international research agendas and enterprises, governmental funding agencies, and corporate and private foundations;
- Knowledge of federal research policies, guidelines, processes, grants, and contracts; administration and legal knowledge of related issues such as intellectual property and export controls;
- Understanding of regulatory and compliance policies and workflows;
- Commitment to promoting and enhancing diversity, equity, and inclusion; and
- Administrative, financial, and business development acumen.

Other requirements that SROs deem essential included:

- Understanding of research infrastructure and national research priorities;
- Collaborative leadership style and an ability to influence and build a shared vision;
- Appreciation for university culture.

Scope and Title

One senior research officer typically holds authority and responsibility across the university. Several of our interviewees founded the office of research at their university, and there seems to be a trend towards developing unitary research offices within universities. While in some cases these offices were the result of a reorganization of reporting lines of disparate offices, in other cases they were the product of mergers of research offices that had previously been distributed at the school level.[10] The decision to centralize the research office was, at least in some cases,

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[9] Julie A. Nash and Diane A. Wright, "Profile of the Chief Research Officer at Major Research Universities in the United States and Examination of the Current Pathways to the Position, *Journal of Research Administration* 44, no. 2 (2013), https://eric.ed.gov/?id=EJ1156072.

[10] Even when there is a unitary senior research officer model, it is not uncommon for there to be vice or associate deans with responsibility for coordinating certain research activities at the school/college level.

part of an effort to strengthen compliance. We did encounter a few different models. In one case, we spoke with a senior research officer who is responsible for the separate research offices of two major universities within a state higher education system, with the responsibility to develop greater collaboration and alignment across the two institutions. In another case, two different administrators share responsibility for the senior research officer role, with one person leading operations and compliance and the other focusing on project development and federal relations. These few exceptions serve to emphasize that the unitary research office, led by a senior research officer, is now widespread.

Related to this, most interviewees framed their responsibilities as being university wide, serving all schools and programs. Nevertheless, given the concentration of external research funding on biomedicine, engineering, and a few other STEM fields, most interviewees spoke implicitly about how their responsibilities were focused accordingly. Some are pursuing strategic priorities related to interdisciplinary collaborations, grand challenges, and the humanities and social sciences (HSS) fields, which we discuss below in Funding Strategy.

The most common titles for senior research officers were Vice Provost for Research, Vice President for Research, and Vice Chancellor for Research.[11] The vice provost role sits in the provost's office and positions the incumbent as a peer to other vice provosts, such as someone responsible for faculty affairs or the budget. The vice provosts are less likely to have substantial responsibility for external affairs. Vice provosts are more likely to be drawn from the faculty, seem generally content enough with the vice provost title, and are more likely to be filled according to the "service model" described above.

The vice president and vice chancellor roles typically report to the president/chancellor and tend to be somewhat more externally facing: they probably more often have revenue responsibilities and sometimes oversee aspects of government relations. There was a general sentiment among this group that reporting to the president was ideal because of the scope and complexity of their responsibilities involving both academic and administrative units. There is a risk of becoming somewhat disconnected from the core academic enterprise overseen by the provost, which several individuals emphasized they worked to avoid, in some cases through a secondary reporting relationship to the provost. An unusual case is the few universities where health sciences does not report to a unitary provost's office but rather is organized at least somewhat separately even if not formally through a "second provost" for health sciences. In such institutions, where there is a unitary university-wide research office, a vice president/chancellor structure may more often be adopted for the senior research officer.

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[11] There were variations such as vice president for research operation and policy, senior vice president for research and innovation, vice provost for research policy and integrity, vice president for research and economic development.

Primary Responsibilities

While no two universities structure the senior research officer role in exactly the same way, we found that the role has a typical set of responsibilities. We describe these, as well as some small but notable variations, in this section.

Common responsibilities include:

- Overseeing sponsored research including grant and contract proposals, pre- and post-award non-financial management, etc. Post-award financial management sometimes was the responsibility of the SRO while in other cases it was administratively part of the chief financial officer's responsibility;
- Providing leadership and support for the research infrastructure, including research computing, space, and equipment, shared research facilities, institutes, and centers;
- Overseeing various compliance operations, including institutional research safety (environmental health and safety, radiation and laboratory safety), human and animal research protections such as the IRB, foreign influence, research cybersecurity, visa policy, etc.;
- Keeping pace with government and funding agency compliance mandates and participating in federal and state research-related policy making;
- Increasing the university's scholarly, economic, and social relevance and expanding the university's reputation as a premier innovation center;
- Encouraging and generating new ideas for research and original scholarly enquiry;
- Developing new partnerships with government agencies, industries, foundations, non-profit agencies, government laboratories, businesses, etc.;
- Establishing, promoting, and sustaining multidisciplinary and cross-institutional teams.

When we asked about core responsibilities, there was a common pattern in which interviewees would articulate the three, or four, or five pillars, or aspects, or elements, of their role, and in a few cases even produced a slide from a presentation that they had given to illustrate this framework. As one SRO said, "The four pillars of my job are compliance and grant submission, communicating research at the university to the outside world, internal matchmaking, monetization of intellectual outputs." Many interviewees had thought clearly about the elements of their responsibilities and had taken the time to understand and organize them. Many had built an organizational structure that clearly reflected the framework through which they understood their role.

Many were happy to express their preferences for some elements of the work over others. For example, a number bemoaned that the most time-consuming and important part of their job was compliance-related. "I used to see all these regulatory organizations such as IRB as a waste of time, making my life miserable, and now I am in charge of them," said one interviewee wryly. Many spoke with enthusiasm about what they saw as the creative components of the work, especially the growth and promotion of research activities across the university. As one said with

excitement, "What gets my adrenaline pumping is thinking about where research is going in the future." It was clear that for many of the senior research officers, the role includes some responsibilities they prefer to delegate and others to which they enjoy devoting their own time.

Many research offices are the product of merging together a number of separate offices and functions. As a result, there are some cases where a variety of compliance and administrative offices, as well as a number of academic centers and research cores, all report directly to the senior research officer. Senior research officers seem increasingly to group these offices and functions under roughly two to five deputies or in some cases placing administrative and compliance functions under a chief operating officer and organizing academic and strategic initiatives separately. In the latter case, the role can be understood as "connecting the research office to the operational infrastructure of the university" given that the senior research officer has "limited time and cannot make it to all these meetings or consider all related issues."

Funding

Budget structures differ widely across major research universities, as do the funding models for the offices of research. While we did not attempt a comprehensive evaluation of funding models, in some cases the type of funding model seemed to be a primary factor in why a research office might have narrower or broader responsibilities.

The most basic divide at the university budget level is between those institutions that use a form of responsibility center management (RCM) and those that do not. For the RCM group, the research office is generally treated as central administration and therefore funded as part of the tax on revenue generated at the school level. In some cases, as discussed in greater length in the Research Support Services section, this model is seen by interviewees as a constraint on centralized shared services. Schools that do not have an RCM model allocate funds to the research office through a budget allocation. In cases where the research office is part of the provost's office and the provost serves as chief budget officer, we were curious if this plays to the research office's advantage. Nevertheless, funding the research office adequately to meet the needs of not only the university's current research portfolio but also its aspirations was mentioned by several interviewees as a challenge. As one interviewee told us, "We are the A in F&A—we are the overhead. We are a cost and we need to justify our position. I want to provide services, facilitate their work, and keep them out of trouble." We heard from a small number of interviewees about devastating budget cuts at their institutions as a result of the pandemic, with full expectation of needing to make extensive cuts to the research office even though revenues from research activities are steady or growing.

At some institutions, we learned of a third model for how the research office in particular is funded that is therefore especially notable. In these cases, the indirect cost allocations from research grants are not simply turned over to the university (or in the case of RCM to the schools) as general funds. Instead, the indirect costs are implicitly restricted, with a fixed share of them directed to the research office and other fixed shares directed for other purposes. From a research office perspective, this model has the benefit of automatically scaling up research office funding with growth in funded research, enabling it to add appropriately to operations,

compliance, research support, and other activities. As one interviewee told us, "It is a better model to float the organization based on an indirect cost recovery model. Then (if you also have internal funds) you can provide start-up and opportunity funds." The budgetary independence that this model affords is probably especially important during a recession where external research funding is the only major university revenue source not under threat, thereby protecting the activities associated with supporting the research enterprise.[12]

Power and Influence

As senior research officers pursue their strategic priorities (discussed below), they exercise a variety of sources of power and influence. Some parts of their authority derive from the operational and compliance offices that report to them. But the scope of their strategic priorities extends far beyond these offices over which they have direct authority. In addition, interviewees told us about a variety of other sources of power that they utilize. It was clear that these varied widely by institution and individual.

Budget authority and influence that allows senior research officers to allocate limited resources strategically is a major source of power for some. As one interviewee commented, "Dollars come in and you need to decide how to use them the best way—from labs to renovation of buildings. Should you put in a center? Support AI or big data?" Discretionary budgets for start-up costs and project cost-share afford the research office substantial leverage and influence, as do internal grant programs. One interviewee explained, "When research money is limited, when budgets are tight, people become risk averse. Sometimes continuation of research that is already being done is prioritized over innovation. I have internal research grants for risk taking research. We favor funding innovative ideas in science, social sciences, and humanities. Then it can be submitted to a funding agency after initial work."

Several interviewees mentioned space allocation for research purposes as an important component of their responsibilities. For some SROs, this was one of the principal elements of budgetary control they held, although in some cases this excludes health sciences spaces. When they mentioned creating and assigning research spaces they were often quite canny. One especially candid interviewee spoke about how research activities will, over time, come closer to breaking even. "You grow research by making it more efficient—clear out people past their prime, bring those working with one grant up to three, etc." Easing out less productive researchers, often through efforts to reduce the space assigned to their labs, was described by several senior research officers as an important, if delicate, component of their jobs.

Beyond budget and its close corollary of space, interviewees told us about several forms of "soft power" that they wield. One of the interviewees described a new interdisciplinary research team that they created and noted, "My office has a convening power. Compared to faculty getting a letter from the chair, I get better responses. Without my office shepherding it, it would have

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[12] This is exactly the dynamic that is playing out today in the COVID recession, as described in Jane Radecki and Roger Schonfeld, "The Impacts of COVID-19 on the Research Enterprise: A Landscape Review," Ithaka S+R, 26 October 2020, https://doi.org/10.18665/sr.314247.

been a heavy lift." Some expanded on the convening authority by emphasizing their neutrality between competing schools and departments: "I oversee multi-disciplinary programs that cross schools and serve as Switzerland," said one SRO describing the need to moderate deans' negotiations. This soft power is especially valuable as they try to develop large team-based and often multi-disciplinary and even inter-institutional research projects, as we discuss below in Funding Strategy.

Collaborators

While it is clear that senior research officers deploy a variety of sources of power and authority, we also wanted to understand who else they work with most closely at their institutions. When we asked about their key collaborators, their responses indicate how the research process touches almost every activity within a university. As the research enterprise gets more complex, building bridges, eliminating silos, and connecting with different stakeholders is gaining more importance.

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It is clearly important for the senior research officer to work extensively with others in central administration. Regardless of who they report to, they stressed the strategic importance of working closely both with the provost and the president to align priorities and strategies. Interviewees often mentioned the growing role of the university counsel and the position's expanding purview as compliance requirements and associated risks continue to augment. They also spoke about the importance of working closely with deans, especially of those schools with substantial levels of externally funded research.

Research computing (sometimes called high performance computing or research IT by our interviewees) came up in interviews as a kind of research support service or shared core that is a vital element of a robust research infrastructure. A number of interviewees observed wryly that, although research computing does not report to them administratively, they either directly allocate the budget or control it through their provost office responsibilities and therefore have all the influence they feel they need.

As discussed at greater length below, there is also substantial engagement with other research support service providers such as research cores and data services. Despite the fact that we were typically introduced to the SRO by the library director, we heard little about engagement with the library, and when we did it was mostly related to research data management services.

The technology transfer office is emerging as an important strategic partner (and in some universities is included in the SRO's portfolio as discussed below in the section on Start-Ups and Economic Development). Driven by the desire to contribute to the local economy, technology transfer offices are broadening their roles to include innovation, entrepreneurship, and economic engagement. All these aspirations strongly intersect with the SRO's priorities as

resource limitations increase the pressure to generate revenue from licensing and innovation activities and form deeper relationships with industry and other community partners.

Strategic Priorities and Challenges

Senior research officers are pursuing an array of different strategic priorities and grappling with a variety of challenges. For most, 2020 was dominated by the sudden suspension of a non-essential laboratory and field research in March as a result of the COVID pandemic, followed by planning efforts to restart as much of the research program as possible beginning in summer.[13] As dominant as these issues have been in the near-term, we elected to focus our interviews on longer-term challenges and priorities to explore what else the SROs have been working on and the directions they may be expected to pursue once the direct disruptions from the pandemic have ended.

Interviewees are excited about facilitating the emergence of innovative and interdisciplinary research fields as well as seeking new and diversified sources of funding through broadening partnerships with foundations, the business sector, and industry. On the other hand, due to the competitive and resource-intensive nature of research, securing sufficient and sustainable funding continues to be complicated. Although new technologies continue to introduce efficiencies and novel research methodologies, burgeoning regulatory and compliance requirements are adding to the overhead of conducting research.

Revenue and Fundraising

Almost all of the senior research officers spoke about money—research funding—as a core strategic priority. As one interviewee explained, research has turned into a multi-hundred-million-dollar source of revenue at their institution, and the role of their office is fundamentally to look after, protect, and further develop this vital component of the university's revenue base and business model. While it is rare for the SRO to directly generate any meaningful share of revenue, some see themselves as a kind of "chief revenue officer" for the research activities of the university.

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At the major research universities, the principal source of external research funding is through research grants from a variety of federal agencies. At most institutions, the National Institute of

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[13] See Jane Radecki and Roger Schonfeld, "The Impacts of COVID-19 on the Research Enterprise: A Landscape Review," Ithaka S+R, 26 October 2020, https://doi.org/10.18665/sr.314247.

Health (NIH) and/or the National Science Foundation (NSF) were the most important funders, but a number of institutions mentioned the Department of Defense, the Defense Advanced Research Projects Agency (DARPA), and the Department of Energy, while one institution noted that it was especially dependent on the Department of Education. Senior research officers are familiar with, and often have built close senior relationships with, the funding agencies of greatest importance to their universities, and many expressed awareness of the major funding programs and political and budget issues that they face. Many have scrutinized the associated dependencies and risks from a revenue perspective. Many of the resulting differences in how they think about funding strategy are explained at least in part by their universities' current revenue structure and potential.

Performance Goals

Many of the senior research officers have formal performance goals that are tied to research funding. These goals vary in how they are structured, reflecting the needs of the university and the mindset of the senior research officer and their supervisor.

The most basic funding goals are based on a measure of externally funded research and have an expectation for how that measure will grow over a period of time. It may be that this type of performance goal is more common among vice presidents of research than among vice provosts. Senior research officers with this kind of goal bring to their work a mindset that is informed at least in part by their revenue responsibilities to the university. At the same time, they tend to have few direct levers to increase revenue and, as one described, they rely on their "soft power" to foster a culture of increased fundraising while trying to provide the greatest possible support for scholars interested in pursuing grants and other sources of external funding. They can also improve processes and systems for seeking grant funding. We discuss these below.

In other cases, fundraising performance is measured carefully but, as one SRO explained, absolute revenue growth is really a lagging indicator, so they often prefer to define the success of their work, and in some cases to be held accountable, based on other types of metrics. For some SROs, the number of proposals submitted in a given year, or the dollar value of those proposals, is a better metric, providing evidence that the university has increased the scale of its research interests and aspirations. A related metric is the share of scholars that submit funded research proposals in a given period of time (in one case due to an intentional effort to increase funded research beyond the STEM fields). Even if a proposal is not funded, an idea is generated or a collaboration fostered, and these can yield funded research projects in the future.

Still others told us that they prefer to think about fundraising more holistically but in the content of external competition. For example, one SRO's performance is periodically tracked based on external research funding relative to a group of peer institutions. As another interviewee told us, "The goal at the end of the day is to have a faculty that is most competitive and that is well regarded by its peers because those are the ones who evaluate us." In both of these cases, SROs were articulating the essentially competitive nature of grant-based fundraising and research evaluation more broadly.

Funding Strategy

Nearly all interviewees described some kind of funding strategy that they were leading on behalf of their institution.

Many emphasized the importance of developing very large grant proposals. As one explained, it is simply "more efficient to implement a large grant than a small one." Towards this end, many interviewees described their efforts to bring in multiple grants worth tens of millions of dollars each, often in collaboration with peer institutions, especially through various kinds of federally funded centers. Developing proposals for these large and competitive grant awards requires the research office to facilitate extensive ideation among the PIs and delicate collaboration with potential partner institutions, not to mention extensive grant writing and proposal development. A number of research offices have individuals and teams dedicated to these purposes, and interviewees described that individual leadership by the senior research officer is frequently a key component of these proposals' successful development.

Several interviewees shared that they were working to rebalance their university's mix of research funding to avoid overreliance on the federal government. Some felt that their institution was over-reliant on a single federal funding agency (such as the NSF or NIH) and were therefore striving to encourage their researchers to raise funds from other agencies. We encountered a few cases where the senior research officer had previous experience working for a specific research funding agency with the objective of pursuing such a strategy.

Additionally, a number of interviewees spoke about the limits of federal funding in general, in the sense that it provides funding for basic research as well as defense-related research, but there are large components of research activity that require other approaches. These senior research officers were pursuing strategies (described below) designed to maximize other parts of the portfolio.

Another major area of strategy was pursuing interdisciplinary or team-based research. When interviewees discussed interdisciplinary work, they often spoke in budgetary terms and talked about how to foster collaborations that cross departmental or school boundaries. Encouraging the development of team-based science continues to be challenging, especially due to the complicated nature of getting credit for being part of a research team. As one SRO commented, "universities are structured around departments and therefore find it difficult to develop norms away from disciplinary structures." Sometimes they feel these types of collaborations are especially difficult in universities that use an RCM budget model. Many of them champion, cajole, and sometimes provide incentive funding to encourage interdisciplinary research. One interviewee explained that "Major centers have economists, biochemists, engineers … all these groups that are not used to working together. We will not dictate but facilitate. Our approach is let us make sure people know each other so that meeting to write a grant is not a last-minute thing."

In addition, a few interviewees spoke about efforts to encourage humanists to seek external research funding. One reported that "We hired a humanist into the grant proposal development role and grants to the humanities skyrocketed." Another interviewee mentioned that, although

funding levels for humanities research would never be as significant as the sciences, for comparatively "little money you can take a huge scholarly leap." Another mentioned the humanities in explaining that it was important to create a culture of opportunity for growth—rather than dependency—across the university.

Although only a handful of interviewees talked about concentrated efforts to stimulate more funded research in fields outside the sciences, disciplines with limited externally funded research activities (especially HSS and certain professional schools) were more often mentioned in the context of interdisciplinary collaborations. Many interviewees referred to the critical role humanities, social sciences, and professional programs (e.g., law, business, policy) play in interdisciplinary teams as they try to address complex grand challenges. Describing that the university aspires to focus on social and social justice issues like human health impact of artificial intelligence (AI), one interviewee reflected, "Our priorities were more interdisciplinary, not like fundamental science or engineering issues. The strategy was to bring scientists and technologists together with economists and social scientists and humanists to focus on domains with high societal impact. But we don't have sufficient money to pursue this vision. It is hard to get government money to pursue this sort of vision." Several interviewees mentioned the internal competitive grant programs and seed grants aim to encourage collaborations among different specialties. "We want to move toward grand challenges based on interdisciplinary and multidisciplinary work so that we can look into the very large areas. But the base is still involved in individual research programs. We know that this work is important, individual PIs are important. But they need to move to a different research configuration."

While interviewees at AAU member institutions spoke about rebalancing research portfolios and growing them strategically, one interviewee from an institution with a somewhat smaller research portfolio reflected on the challenges of actually creating a culture of research. They described efforts to ensure that performance expectations for scholarly research and research funding were just as strong as those for teaching. While we do not extensively cover the role of senior research officers outside of the largest research institutions, it is an important reminder the role takes on other characteristics and priorities at other types of universities.

Corporate and Philanthropic Partnerships and Development

Diversifying research funding beyond the federal government is important not only to provide stability through diversity but also to fund priority areas that may fall outside the mandates of the federal funding agencies. Two major directions, which in some ways are interrelated, are corporate research partnerships and various types of philanthropic support for research, including corporate philanthropy.

An emerging priority within the research office is contributing to relationship building and nurturing the university's relationships to cultivate and engage potential donors (individuals, corporations, and philanthropic organizations) in supporting new initiatives, programs, and various research activities across the university. Some interviewees emphasized that this revenue stream seems essential to support politicized research areas such as climate or stem cell research. Several interviewees mentioned that they are increasingly involved in discussions and

negotiations with potential donors. Referring to the university's alumni, one interviewee noted that the motivation of potential donors with capacity to give is "changing significantly from the loyalty and happy memories to interest in having an impact on major societal issues." In several cases, the university has moved the office responsible for fundraising from corporations under the reporting structure of the senior research officer or with a strong dotted line reporting relationship to them.

While corporate philanthropy is one important factor, there were several comments indicating that building broader relationships with businesses is "a top priority as that's where there are jobs for our graduates." There were multiple incentives for working with companies including collaborative research, possible scholarships and support for students, and creating internships and career tracks for graduates. Some SROs viewed corporate and philanthropic funding as a major source for research areas that are underfunded by federal agencies and mentioned their efforts to support researchers in building such relationships.

Processes and Systems

Numerous interviewees mentioned the need to improve processes and systems for seeking research funding. They spoke about this work vividly, for example their efforts at "knocking down barriers" and "streamlining the bureaucracy." It was clear that, given the nature of the senior research officer role, this is one of the most significant tools they possess to meet a goal of increasing grant applications and ultimately grant-funded research.

Interviewees spoke about organizational structure as one of the opportunities to streamline. In recent years, a number of them have merged together some of the offices that report to them, brought in offices that previously reported to a chief financial officer, or grouped together offices under the authority of an associate/deputy senior research officer. The purpose of these actions was often discussed in terms of easing the administrative burdens on researchers applying for grants. In addition, where some responsibilities such as support for proposal development and research administration are distributed to the schools rather than centralized university-wide in the SRO office, interviewees spoke about some of the resulting challenges, such as an inability to match funder-specific proposal development expertise with faculty researchers, and the challenges to interdisciplinary program development. While some SROs spoke about the need for centralization, in other cases they were developing elaborate work-arounds to ensure that interdisciplinary research in particular could be effectively supported.

Other senior research officers are focusing more on systems. These interviewees discussed the need for administrative systems to be linked and automated, reducing data entry and other burdens on faculty members.

Increasing Impact

Revenue is undoubtedly an extremely important goal for most of the senior research officers. At the same time, many contextualized this aim in the broader strategic purpose of the research activity. Recognizing the extent to which other university activities from state appropriations

and tuition to clinical care and ancillary revenues cross-subsidize the research enterprise, one senior research officer told us, "We need resources to do the work but it's not just about revenue. If you only looked at the bottom line it would be better that we do no research at all. The purpose is to create knowledge, educate future researchers, and get the innovations out there."

At a high level, we note that hardly any of our interviewees raised traditional metrics of scholarly impact, such as the volume of research articles published or the impact factors of journals in which those articles appear. When metrics like these were discussed, it was typically in the context of the university's competitiveness with its peers—for talent recruitment, grant-seeking, and similar purposes. One senior research officer expressed satisfaction that their institution's hiring, promotion, and tenure processes have come to incorporate a broader array of non-traditional impacts.

In this section, we review some of the non-traditional forms of impact that senior research officers raised in our interviewees as strategic priorities. We note that interviewees prioritized these non-traditional impacts somewhat differently at public and private institutions.

Public Engagement and Government Relations

For some of the interviewees, especially at public institutions, generating public awareness and political support for research activities, and defending against critiques, is a core priority. In various ways, they explained to us the importance of communications and government relations, to ensure they are effectively telling the story of the importance and impact of the research being conducted, both to advance broad political support for research and to defend against some political risks.

A common concern expressed by several interviewees was the erosion of public support for science and questioning of the value of university. They gave several examples to illustrate how they were strengthening strategic marketing and communication efforts to "get the story out, communicate the value of research, help the public understand the value of education and investment in it." This pressure was acute especially for public institutions. "How are taxpayers benefiting from investment made in public universities? This area has growing importance," said one interviewee. "We need to communicate better what we do to the taxpayers who pay a third of our salaries," said another. This SRO described how they were spending a lot of time working with faculty to refine their communication skills so that they can "talk less about numbers and more about the research process and implications." For one interviewee, traditional academic impact factors continue to be important for promotion but what really counts is a researcher's ability to articulate clearly why we do research, "not only because it is interesting for us but we think that we can make a difference in the world."[14]

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[14] The shift towards these broader understandings of impact is one we have been observing for some time. See Danielle Cooper et al, "Supporting the Changing Research Practices of Public Health Scholars," Ithaka S+R, 14 December 2017, https://doi.org/10.18665/sr.305867, and Danielle Cooper et al, "Supporting the Changing Research Practices of Civil and Environmental Engineering Scholars" Ithaka S+R, 16 January 2019, https://doi.org/10.18665/sr.310885. Funders have played a role in shaping this direction as well. See for example, "Perspectives on Broader Impacts," Nation Science Foundation, https://www.nsf.gov/od/oia/publications/Broader_Impacts.pdf.

Government relations, either formally or informally, is a related priority for some senior research officers. Several of the interviewees from public institutions in particular have built direct relationships with their governor's office, enabling them to address any political concerns that might arise (one senior research officer told us at length about concerns that had arisen with stem cell lines) and "nip them in the bud." Even if state appropriations do not directly support very much of the research enterprise, several senior research officers made clear that they take direct responsibility for ensuring that state government relations are effectively managed. And as mentioned above, sometimes a government relations office reports directly to the senior research officer.

Start-Ups and Economic Development

Research universities perceive themselves as hubs of innovation where new knowledge and ideas are created every day. Many universities are today working to foster an environment where research can be commercialized through start-ups and technology licensing and transfer. At public universities, this is often an element of efforts to foster economic development in the institution's state or region. Several interviewees stressed the significance of translating research into products within the state. One interviewee described extensive efforts in working with departments and deans to have them understand how collaborating with industry is different from getting federal grants and that "economic development will even be more essential in getting recognition and bringing money." While in the majority of larger research universities, responsibility for this activity is held with another university official, we interviewed several senior research officers who also focus on what they sometimes call "innovation" as a strategic priority, and it was our sense that this combination is growing in frequency.

Several interviewees who held such combined responsibilities emphasized the strategic importance of the innovation portfolio, in at least one case over and above the research elements, and such interviewees were passionate about the importance of this work. When new inventions are ready to be introduced to the world, the research office takes a key role in supporting the researcher from the stage of market and commercial potential exploration to steps towards licensing inventions and filing patent applications. As one told us, "Tracking start-ups, how many companies are being launched, technologies being developed—10 years back, the numbers did not matter much—it was more citations and research dollars." But now, this interviewee explained, "when dossiers are evaluated, we want to give this type of activity equal weight. [We want our scholars to] excel in scholarly activity as well as commercial."

In cases where they held combined responsibilities, the senior research officer often had earlier career experience starting up companies based on their own research. To recognize the scope of their responsibility, these individuals may have an expanded title such as "Research and Innovation" or "Research and Economic Development." It was difficult to tell if this was a strategic combination that could be expected to outlast the current incumbent or simply a convenient combination where there is an individual holding two sets of skills.

In the majority of universities, these responsibilities are not held by the senior research officer, either because they are not important to the university or, in a greater number of cases, because there is a separate university leader with a focus on them.

Research Support

We asked interviewees about research support services in a very intentional manner, inquiring about "services that support research such as shared facilities, research computing, and the library." This produced a wide-ranging set of responses which clustered into a fairly clear set of patterns. One consistent theme across the clusters is a real struggle that research universities face in the extent to which research support services are provided on a distributed basis through schools and departments—making them more responsive to researchers but often causing inefficiencies and limiting professionalization—as opposed to being coordinated or centralized across the university.

Research Cores

The most important research support services across virtually every interviewee are "research cores," or instruments and other assets that are administered on a shared basis rather than by a single research lab. Research cores are probably the most important enabling service that senior research officers worry themselves with, ranging from microscopes to telescopes and including everything from nuclear facilities to animal care facilities.

Research cores are important for a number of interrelated reasons. Most importantly, they enable capital investments at a level that would be impossible within a single research project or research lab. They are described as very important in researcher recruitment, not only as an enabler of a current research agenda but also as tangible evidence of the university's commitment to continuously invest in supporting a given area of research. And in many cases, they enable professionalized staffing models, ensuring that instrumentation experts are directly conducting or closely collaborating on research projects.

At most major research universities, at least some research cores report administratively to the senior research officer, sometimes through some kind of faculty director who oversees a group of them. The level of centralization varies widely, in some cases reflecting budget structures. At some universities, the vast majority of research cores are funded and managed at a school or departmental level. In particular, it is fairly common for a medical school to acquire and manage its own research cores. Several interviewees were passionate however that centralizing research cores (through their office) was the best way to drive efficiency into this work and to maximize campus-wide sharing. It seemed that the trend at the moment, at least, is towards greater centralization in order to leverage the investment in setting up core facilities and keeping them up-to-date with new equipment and tools. We look separately at research data services, which are typically not centralized, or at least not yet, in the section below.

Funding and business models for research cores is a complicated priority for senior research officers. In some cases, senior research officers have found themselves "passing the hat" among

deans, department chairs, and individual researchers, attempting to cobble together the capital necessary to buy a new instrument. In other cases, it is more likely that the research office's budget provides substantial upfront capital to enable the purchase of research cores. Different budget models are at the heart of these differences, which in turn seem to influence how these shared cores are organized administratively. At least one senior research officer described the "pass the hat" model as a principled approach, since it demonstrated that there was broad "skin the game" for the instrument in question which therefore could be assured of widespread use. Most others seem to view it as an inefficiency.

The research cores that are administered through the research office often operate on a cost-recovery basis. That is, they charge fees for use, which are budgeted for in research grants and then billed back to them as an expense. The hope most often expressed was that these usage fees would cover operating and maintenance costs, at best. It was unusual that these models were structured to amortize very much if any of the capital expenditures associated with purchasing the equipment or building the facilities.

It is uncommon but not impossible for research cores to be shared on a cross-institutional basis. The most common example of this is probably shared telescopes, where some universities make substantial one-time payments to fund the construction of an observatory that is shared by a group of universities, with telescope time allotted on the basis of those original contributions. A few senior research officers expressed an interest in developing models to share other research cores, in some cases on a state-wide or regional collaboration basis.

During the period when we were conducting our research, the hot new shared core was the Cryo-EM, a newly developed type of electron microscope that in its most recent instantiation allows protein imaging at an atomic level.[15] At least half a dozen interviewees told us, unprompted, about their efforts to secure one or more Cryo-EMs for their institutions. They saw real urgency to this acquisition, because it would enable them to compete for talent that would otherwise prefer to work or study elsewhere and for projects that would otherwise be impossible to conduct. A single Cryo-EM represents a multi-million-dollar capital investment, and securing the funding for this acquisition and providing for its ongoing maintenance and efficient shared use were key elements of the senior research officers' involvement.

Research Data Services

One important area of focus for many interviewees—sometimes more from a research enablement perspective and at other times more from a compliance perspective—is research data. For the most part, senior research officers focused on research data management. One interviewee told us that "we need to do better around data: data handling, storage, provenance." Another told us that "This is a university issue, not specific to a discipline. No university has this right. This is a big thing. There is an opportunity for national leadership as no one is doing it right yet." Many senior research officers are grappling right now with how to provide consistent

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[15] See for example Robert F. Service, "Cryo–Electron Microscopy Breaks the Atomic Resolution Barrier at Last," *Science*, 21 October 2020, https://www.sciencemag.org/news/2020/10/cryo-electron-microscopy-breaks-atomic-resolution-barrier-last.

research data management and to develop a broader array of research data services, as well as how to assign responsibility and secure budgets for them, and they do not feel there is a blueprint for how to do so.

> Many senior research officers are grappling right now with how to provide consistent research data management and to develop a broader array of research data services, as well as how to assign responsibility and secure budgets for them, and they do not feel there is a blueprint for how to do so.

Many interviewees who discussed research data were emphatic that compliance responsibility for the public access mandate fell under their office.[16] In some cases, this was the result of some kind of working group or bureaucratic process to gain this responsibility. Several interviewees noted that, as one told us, data management plans are "easier to write than operationalize."[17] Moreover, there was a sense that treating public access to research data as only a mandate was limiting and that instead researchers needed to be helped to see public access as part of "our responsibility to make the products of research more accessible and shareable. How do we make this information that taxpayers pay for much more available? It will drive forward discovery more quickly."

Beyond public access, it was clear from many interviewees that data services were largely a distributed and often uncoordinated function within the university.[18] One interviewee bemoaned that "each lab has their own system," and another described this lack of coordination as a "headache."

Several interviewees reflected, unprompted, on engagements with the library at their institution to support data management and public access. In some cases, this was welcome, with one interviewee telling us that the "library has been ahead of the curve in providing resources like data librarians for our faculty." In other cases, though, the library was seen as a minor player or even an interloper. For example, one interviewee was quick to clarify that "Public access mandates & research data management has recently come under my purview. We get some support from the library. They help write data management plans." Another interviewee told us that the "library wants to become the data manager but we already have units that do that at the university."

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[16] In 2013, the White House Office of Science and Technology Policy (OSTP) issued a directive for federal agencies (that fund more than $100 million in research) to develop policies requiring public access and re-use rights to peer-reviewed publications and digital data arising from that funding. See the Memorandum on Increasing Access to the Results of Federally Funded Scientific Research, https://obamawhitehouse.archives.gov/sites/default/files/microsites/ostp/ostp_public_access_memo_2013.pdf.

[17] A data management plan (DMP) describes the data that will be generated or acquired during the course of a research project, and details how data will be managed, described, analyzed, stored, archived and shared.

[18] This reflects other recent research. See this important piece by our colleagues Jane Radecki and Rebecca Springer, "Research Data Services in US Higher Education," Ithaka S+R, 18 November 2020, https://doi.org/10.18665/sr.314397.

We spoke with a few senior research officers who felt satisfied with the substantial progress they had made in recent years to tame research data, especially in terms of data security and compliant storage. As one told us, "We have created a regulated data environment. We hired a director and a couple of experts to work with faculty. This is a huge deal. We are transitioning existing [distributed data] facilities into core facilities—modernizing them by making sure that there are consistent and auditable policies. We recently developed a university data policy."

Many others will be working towards such outcomes in the coming years. A few interviewees described current efforts to address the inefficiencies and gaps that have resulted from a lack of coordination across distributed services, not only on research data management or data security and compliant storage but more broadly. In a few cases, this involves a collaborative structure, for example with the CIO and library director, to bring together research data services organizationally or at least in terms of how researchers can engage with them. Another interviewee told us resignedly that they would probably have to bring together a working group, mostly of faculty members, to formalize the lack of coordination as a problem and begin developing a set of solutions.

Research Workflow Tools

Research cores such as instrumentation were a strategic priority for every interviewee, and many interviewees discussed research data. Other software to support research data gathering and analysis, such as lab notebooks and survey platforms, did not seem to rise to the attention of the senior research officer.

Many interviewees were familiar with electronic laboratory notebooks as a category but we did not encounter a case where implementing a common solution was a priority at the senior research officer level. The reasons varied. Some interviewees explained that, although there could be some economies of scale in establishing an enterprise solution, disciplinary needs varied too widely. One interviewee said that the research office avoids involvement in platforms and systems beyond compliance, research administration, and clinical trials. Another explained that enterprise research software is handled by a subsidiary office, and "I have a distance from them as there are too many details to manage. It does not come to my strategic purview so I delegate to my staff. I am sometimes involved with resource allocation decisions." Finally, one indicated that their office had supported a library-led pilot on laboratory notebooks that "didn't get a lot of participation."

Compliance

Over time, regulatory requirements and processes designed to ensure the university's compliance to ethical and societal values have grown significantly. In our interviews, by far the most significant developing compliance issue was research security, foreign influence, and export control.

In 2018, the federal government invested about $42 billion in research and development activities at research universities.[19] Almost every interviewee was mindful that a large portion of these funds are spent on administrative tasks related to research rather than the research itself. A recent survey revealed that university academic researchers spend 44 percent of their research time on administrative tasks.[20] Our interviews revealed the tensions they face in setting a balance between accountability and risk management as they try to ensure that researchers' time and efforts are used effectively and efficiently. Compliance processes and tasks inevitably divert faculty time from research and education and put further pressure on university budgets due to the increasing administrative support needs. These compliance responsibilities are seen as necessary, and they are a growing expense center for the universities, but critics would undoubtedly point to them as an example of "administrative bloat."

The most pressing new compliance issue relates to the concerns of policy makers and federal science agencies about undue foreign influence on federally funded research, which are attempting to safeguard national security and economic competitiveness. Most interviewees were quite direct in speaking about this set of concerns as increasingly, if not solely, being about China, in which they are experiencing part of a far broader realignment of the scientific enterprise in the US and other democracies.[21]

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The resulting compliance issues are still developing, and interviewees reported spending a great deal of time and bandwidth over the past several years (even during the disruptions from the pandemic) trying to understand the issues, build an organizational process and structure that could ensure compliance with federal regulations, and educate faculty members about the issues and how to comply. There were several references to the implications of the China's Thousand Talents Program, which incentivizes researchers abroad to transmit knowledge and research gained back to China. The particular concern there is that researchers must disclose other sources of funding (including Thousand Talents) in grant applications, which are ultimately submitted under the name of the university and therefore could be seen as responsible if the researcher fails for whatever reason to make a full disclosure. There are a variety of other related compliance issues, including those connected to export controls, that have required the updating

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[19] National Science Foundation, "Academic R&D in the United States," https://ncses.nsf.gov/pubs/nsb20202/academic-r-d-in-the-united-states#:~:text=and%20Engineering%20Indicators-,Federal%20Support,HERD%202018%3A%20Table%201.

[20] Sandra L. Schneider, "2018 Faculty Workload Survey: Primary Findings," Federal Demonstration Partnership, https://thefdp.org/default/assets/File/Documents/FDP%20FWS%202018%20Primary%20Report.pdf. Also see Lisa Mosley, Jeremy Forsberg, and David Ngo, "Reducing Administrative Burden in Federal Research Grants to Universities," IBM Center for the Business of Government, 2020, https://cohortforresearch.com/wp-content/uploads/2020/02/Reducing-Administrative-Burden-in-Federal-Research-Grants-to-Universities.pdf.

[21] Roger C. Schonfeld, "Global Science and the China Split," Ithaka S+R, 27 October 2020, https://doi.org/10.18665/sr.314295.

of internal policies and processes, increasing compliance staffing, and providing oversight of this emerging area. Several interviewees, including one who said this is a weekly occurrence, mentioned that FBI agents regularly visit their campuses making clear that this is an area of substantial risk management for senior research officers.

Many shared concerns about the impact of new requirements on the collaborative nature of science, basic principles of scientific openness, and the free exchange of ideas. Many also are worried about the implications on talent acquisition (as discussed below).

Beyond these broad reactions, some interviewees reflected on their own views about this area of compliance. One set of interviewees felt strongly that much of the federal scrutiny they were experiencing was politicized, a reflection of what several described as the Trump administration's xenophobia. For these interviewees, there are deep concerns about potential racial profiling. Another set believed that there was a real underlying national security problem, including one interviewee who said "these are real issues if you're cleared in on a classified level." Some reflected on particular problems they had addressed or learned about at other institutions. One interviewee was extremely frustrated to find themself responsible for investigations of faculty members on these matters and, as a result, expressed an intention to leave the position sooner than they otherwise would have anticipated doing. The majority of interviewees did not express a view either way.

Talent

While few of our interviewees spoke in terms of talent management, it was clear that a most important strategic priority for many of them is to recruit and develop researchers who will strengthen the university's research competitiveness. While this is a responsibility they share with colleges and departments, our interviewees regularly emphasized the importance of this work for them.

One of the tools that several senior research officers have at their disposal in shaping a university's research enterprise is in influencing, if not determining, how research faculty vacancies are filled. In these cases, senior research officers are closely involved in repurposing vacant FTE allocations (where otherwise individual "departments tend to replace whoever has just left") to allow the university to build clusters in newer and often interdisciplinary fields such as data science.

One recurring topic was hiring new researchers, especially in STEM fields. For our interviewees, a key element of early career recruitment is negotiating start-up packages to provide resources until they establish their projects and secure external funding. Included in negotiations were research equipment and technologies, reduced teaching load, and allocation of research assistants. Separately, a small number of interviewees described a sort of "arms race" that can emerge for some of the most talented researchers, who are at times able to demand extraordinary "start-up" packages in a competitive environment, only then to go on the job market a few years later to do so again.

Building equity and diversity, and creating opportunities for their students with varied backgrounds, stood out as a priority for some of our interviewees. Several of them described how they were trying to understand barriers, as practicing the values of diversity, equity, and inclusivity (DEI) was "easier said than done." Illustrating the perceived systemic challenges, an interviewee reflected, "Science is an inherently biased and subjective process, it is all about who knows you and who is your advisor. How do you enhance diversity given the academic culture? You cannot fix this problem with more money." This interviewee referred to the "pipeline problem" and stated that there simply were not enough qualified candidates to achieve the university's diversity goals.[22] Some interviewees assumed a more comprehensive perspective in their DEI efforts. For instance, some university research offices are extending their purview to undergraduate students to ensure that "there are sufficient numbers of underrepresented undergraduate students involved in research." Another interviewee stressed that "DEI is at the center of our priorities," while another emphasized that the "Research community cannot sit on the sideline and say it is a provost's job—everyone needs to chip in."

Several interviewees noted that foreign students and scholars are essential to the research enterprise at their institutions and spoke passionately about challenges they have already faced, and especially those that they fear may arise, in foreign recruitment. These senior research officers are concerned in general about federal hostility towards foreign-born scientists working in the United States in recent years. One told us that "An important element of the greatness of research in the US. I fear that the US is becoming less attractive to foreign scientists," and another said "Our ability to recruit the best of the best and give them an environment where they can freely apply their talents is at risk. This can hamper the efforts in science and technology. What happens if the best and brightest international students opt to go somewhere else?"

The compliance priorities about research security and foreign influence discussed above are directly connected with these concerns about talent pipelines. Interviewees expressed concern especially about tensions with China, both on the supply side that there may be reduced willingness among researchers to study or work in the US and on the demand side that regulations such as visa processes may become greater impediments. One senior research officer noted that in some specialized fields, graduate students from China comprise a plurality if not a majority of the program and that if this talent pipeline were to face impediments that for those fields the university in question could face dramatically reduced research capacity and therefore a negative impact on its research competitiveness.

Leadership development for researchers was another area of focus for some senior research officers. Assuming a leadership role for a research initiative or a core facility requires not only outstanding academic skills but also necessitates a host of other skills needed to effectively manage teams, oversee collaborations, and navigate internal and external complexities and inevitable interpersonal issues. SROs recognize that what they variously called "soft skills" or

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[22] Some experts see little evidence that the lack of diversity among STEM faculty is the result of an actual pipeline problem. See for example Wendy L. Hill, "The Myth of the STEM Pipeline," *Inside Higher Ed*, October 2, 2019, https://www.insidehighered.com/views/2019/10/02/negative-consequences-pipeline-metaphor-stem-fields-opinion.

"leadership skills" or "the business part of working together" is often not a part of the educational programs that prepare individuals to assume academic positions. "We are hiring some bright junior faculty but they come with no training on professional development and strategic growth. We want our faculty to be more purposeful and intentional about their career progression and collaborations," stated one interviewee. Another described the research office's efforts to provide an interdisciplinary mentorship program, especially to junior faculty who are keen on establishing broad collaborations but often lack required skill sets and experiences. A more intentional approach to helping skilled scientists develop into academic leaders was a theme for this group of interviewees.

Research Analytics

Some interviewees commented on how competitive academic environments require efficient and highly responsive evidence-based decision-making that depends on data-rich information systems. There were a handful of success stories. For instance, one interviewee described how they wanted to quantify and look at collaborations and what is funded and published at the schools and also at university-wide centers. Based on this analysis, they decided to close or merge some research centers. Interviewees also offered several examples to describe what they considered "dream data" that was not currently available to them. For instance, one wanted to analyze the outcomes of a grant not only limited to papers written but also doctoral students trained, patents generated, companies engaged, etc. Some other examples included understanding the competitive landscape for specific research areas, assessing DEI among faculty and graduate students, and deciding on how to invest in additional core facilities. While some were using analytics successfully, or had hopes of doing so, we also heard many regrets that internal data pertaining to the university is very often siloed and sometimes anecdotal or difficult to compare. And some senior research officers are still wrestling with the investment required, as one explained, "I don't have the access I need to get data. It requires investment. Is it a priority? Or should I fund more grad students?"

One of the principal organizational impediments seemed to be the distributed nature of responsibilities pertaining to research analytics and difficulty in assigning responsibilities to different campus groups and coordinating their efforts in a cohesive and effective manner. We spoke with a few interviewees who had already established, were considering, or were in the process of creating a research analytics unit to lead and coordinate the university's efforts to support data-driven decision-making about the research enterprise. In other cases, the university institutional research offices with expertise in collating and analyzing local data were often mentioned as important stakeholders in providing the necessary data analytics services. But one interviewee explained that while in theory institutional research is available to assist with such work, in reality collaborations with institutional research were project-based and could not really be embedded adequately in the decision-making workflows of the research office.

Interviewees were mindful of expenses and difficulties in harvesting, harmonizing, and making usable such intelligence from a multitude of distributed sources. Often, they mentioned how the data systems do not "speak to each other" indicating that they are not interoperable. They were

familiar with the Research information management (RIM) category.[23] There were some examples of the library involvement by deploying RIM systems, especially to outside audiences. Related categories of research analytics systems enable university leaders to assess research competitiveness and competitors on a field-specific basis, features that are intended to help universities prioritize strategic investments.

Our interviewees expressed a mixed view on these various categories of research analytics systems. Although they were generally familiar with the category, the majority was not engaged with them, either because they did not see the importance of research analytics or because it had been delegated to a subsidiary office. Enough interviewees were familiar enough with the systems to discuss the options that were utilized at their institutions, but most commonly because they expressed a considerable level of dissatisfaction with their institutional RIM systems. "None of them really does the job," reflected an SRO. Another said that one tool they use "has improved a lot but we are not in the place where we should be in the age of big data." One of the SROs commented that, compared to industry use of data analytics, academia is a small player, and research analytics are especially underdeveloped. Some felt that "faculty uptake and acceptance was very questionable."

They acknowledge that, similar to finding common research workflow tools, implementing campus-wide systems was difficult as each school, even sometimes each department, wanted to do things their own way. One SRO expressed deep concerns about efforts to standardize metrics without taking into consideration different disciplinary practices, especially pertaining to humanists and social scientists. Another felt that research analytics tools make it easy to assess research based on indicators such as research volume, funding, and university ranking but questioned the usefulness of such information and added, "This is very frustrating for humanists who do not rely on external funding although some may get money from gifts. We don't have an across-the-board assessment metrics for research activities."[24]

Demonstrating that decision-making is an art and a science, several SROs felt that research analytics systems often fail to incorporate contextual or institutional practices and values. There seemed to be a keen recognition for the role of quantitative data but some SROs stressed the importance of qualitative factors and stated that there were not many good tools for making holistic decisions. Although "counting things" was informative, judgment was an irreplaceable tool in decision-making as the SROs discussed the importance of personalities and having the right leadership characteristics as they form new teams and launch initiatives. "It is like a small

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[23] RIM involves the aggregation, curation, and utilization of these data about research activities and outputs from a multitude of internal and external sources. Some examples include VIVO, Converis (Clarivate Analytics), DSpace-CRIS, Elements (Symplectic), Pure Elsevier, Esploro (ExLibris), Profiles. During the last two decades, there has been a growing emphasis on gathering and analyzing academic research intelligence through deployment of RIM systems.

[24] Alterline, an independent research agency, was commissioned by Ex Libris to assess the experience of researchers and senior members of university research offices in conducting, and supporting the production of, research at institutions of higher education in the US, UK, and Australia. Based on findings from a survey of 300+ researchers across a range of disciplines and 100+ senior members of research offices, one of the key findings was that although measuring research impact is increasingly important, it's not clear how to meaningfully measure it and there are significant challenges in showcasing researcher profiles and keeping them current. See, Alterline and Ex Libris, *Supporting Academic Research: Understanding the Challenges*, 2020, https://www.exlibrisgroup.com/supporting-academic-research/.

town, who is responsible, who has a good reputation, who is seen as a good university citizen?" stated an SRO.

Evolving Roles and Future of the Position

One of the concluding questions we asked during the interviews was about the future of the position and how the SRO role is evolving and changing. Several reflected on changes within their existing scope of responsibility or otherwise affecting academic science.

Several SROs stressed that over the last decade there has been a significant shift in the way science is conducted, requiring new partnership configurations to bring around the table researchers, scholars, and practitioners from different disciplines to tackle highly complex social, medical, and financial issues. "The research university functions on the premise of innovation and advancement although it often lacks the organizational models that support risk-taking and agile strategies," reflected an SRO. There have concerns about the over-reliance on legacy organizational structures and collaboration models, emphasizing the need to "turn the boat" to reinvent the research enterprise before "it is outmoded and disrupted." Some feel that universities cannot continue to afford supporting the required expertise alone and need to form consortia to address bigger problems such as sustainable energy. "We are used to competing, there is always tension between collaboration and competition," said an interviewee. Several SROs underscored the need to move their offices "from a transactional model to a much more strategically engaged office" that fosters both internal and interinstitutional partnerships. "People are more expensive than machines. We have huge transition costs as new people move around," said an interviewee and stressed the importance of thinking about new ways universities can share faculty and research facilities like the high energy physics community.

Looking down the horizon to project how their offices will need to evolve, the interviewees stressed the expanding significance of innovation and entrepreneurship. "Engagement with the world and societal impact will be a more important part of what we do." Although they consider government-funded research to be the backbone, they project needing expanded revenue streams from businesses, industry, and philanthropic organizations.

SROs are concerned that the research office's scope is becoming more complicated due to the greater levels of oversight and accountability requirements, necessitating additional resources to fulfil the expanding responsibilities. Some SROs feel that this inevitable administrative growth further exacerbates concerns about expensive leadership structures and the overhead required to run the university in the face of diminishing public trust in the value of higher education. Several interviewees believe that SROs will have an increasing responsibility in reestablishing reputation and demonstrating the role a research university plays in the vitality of the community. Several interviewees wondered how the distributed versus centralized services approach will evolve and what would be the consequences on the university budget models and research support services. They recognize the inevitable tension between the desire to achieve economies of scale for efficiency and nurturing a distributed and independent research culture to foster innovation and scholarship.

Although it was unusual for an interviewee to raise teaching and learning as an area of emphasis for their office or the impact of their work, a handful went out of their way to emphasize the deep integration of research and learning that they were trying to enable, speaking mostly about the importance of integrating research into the undergraduate curriculum. At least one interviewee saw this as a critical opportunity to diversify those undergraduates who were interested in research and thereby build a talent pathway for undergraduates of color and low income students to pursue graduate education and ultimately join the ranks of scholarly and professional researchers. Noting that the AAU metrics mainly focus on graduate students, another interviewee explained how they were expanding their footprint in undergraduate research to better align with the university's strategic priorities. "As student success and learning outcomes get more attention, presidents and all senior leaders are now focusing on undergrad education and connecting with parents who pay the tuition." This interviewee described partnering with the dean of undergraduate education and with career services as they are keen on contributing to the economic development in the area. We suspect that engaging with the instructional enterprise, especially in terms of coordinating undergraduate research opportunities, may be a growth area in the SRO portfolio at other universities as well.

Structural Reflections

We approached this project with a keen interest in the implications for university organizational structure of the senior research officer role and we were not disappointed. As the research enterprise remains a stable if not growing source of revenue in universities facing pressures elsewhere due to the pandemic and recession, there is every reason to expect the role of the senior research officer to gain further importance along with the research enterprise. In this concluding section, we reflect on some of the key implications of our findings for the structural directions that the university may take in the future.

Our interviewees told us time and again about various ways that they were eliminating silos. There is evidence of this in their work to streamline administrative and compliance processes, but even more important are their efforts to eliminate academic silos, for example by centralizing and therefore more effectively sharing research support and by stimulating the creation of interdisciplinary projects and programs that cross departmental lines. There has been a significant shift in the way science is conducted as highly complex social, technical, medical, and financial issues require bringing around the table researchers from different departments. This trend puts increasing pressure on the research university to balance distributed and centralized services without altering the dynamics of autonomous research culture. Enabling this trend, by eliminating impediments, is one of the most vital parts of the senior research officer's activity. Taken to an extreme, one could characterize the colleges and departments overseen by the provost as structural impediments that the senior research officer is charged with overcoming.

Looking ahead, we are left with a number of questions about the organizational structure of the senior research officer role. Today, the role typically combines a set of enablement and support roles (research cores most prominently but also research data management and other

considerations), administration/process (proposal development, grant administration, etc.), and compliance functions (such as health and safety, human and animal research protection, and foreign influence). The logic for combining administration/process with compliance is two-fold. First, that there are systems integration and other process improvement opportunities, in other words that the desire for systems integration drives organizational structure (a key rationale expressed by some interviewees in attempting to bring grant administration under their purview). Second, that having a research leader overseeing these administrative and compliance processes will make these processes more palatable to researchers who otherwise might rise up against the bureaucratic interference, while also allowing compliance issues to be resolved directly with the funding agencies which often are the counterparties. Looking ahead, we anticipate that some universities may choose to experiment with several other structures. First, there could be a logic to combining research compliance functions with other university compliance, much of which is the responsibility of the general counsel. Second, while research support is currently quite broadly distributed across the university, there could be a logic to strengthening ties between research cores, data services, certain library collections and services, and other research support activities at the university. While we do not have evidence to suggest that either of these models would be an improvement, it does not seem that the current configuration of the role, even if it is widely shared across many institutions today, is yet fully settled.

Recognizing that the role itself is not fully settled, we close with an observation about broader structural implications in universities where the senior research officer reports principally to the president. For these institutions, there are now two university level officers with academic responsibilities—a provost and a senior research officer. Is there a scenario in which the SRO gains administrative authority and academic power such that the role becomes nearly co-equal with the provost? Will the provost retain budgetary authority and thereby continue to serve as first among equals? While our interviews with senior research officers did not explore these questions directly, we anticipate the scope and authority of the senior research officer to grow further at many research universities.

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Appendix: Interview Guide

Tell me about your position and key responsibilities (to supplement information gathered through job descriptions etc.) What is your main role? What brought you to this position?

- What does your day-to-day workflow look like?
- Size of your staff?
- Who do you report to? President, provost, dean of research?
- Who reports to you?

Who are your key collaborators (internal and external)?
- In your role, who do you collaborate with on campus?
- Is there one entity that you collaborate with the most?
- What do your internal and external collaborations entail?
- Work with IT, library, labs, large scientific equipment/facilities, etc.

What were your strategic priorities (prior to the pandemic)?
- Consider disciplinary variations STEM, life sciences, humanities, etc.

How are the services that support research such as shared facilities, research computing, and the library evolving in your institution?

What new responsibilities, or roles has your position taken on recently?
- public access mandates & research data management
- research workflow tools/support
- communities of practice (with technology development, research data, open science, etc.)
- DEI issues—public access to knowledge
- communities of practice (with technology development, research data, open science, etc.)

How does your office support research information management and workflows?
- aggregation, curation, and utilization of information about research activities
- research activities and outputs (publications, datasets, and patents;), grants and projects; academic service and honors; media reports; and statements of impact
- Systems and databases used (e.g., Symplectic Elements)
- distributed responsibilities in gathering, analyzing, etc. RIM

What are your challenges in your position? What are unmet needs?
- hyper-competition: escalating competition for limited resources?
- limited/inadequate resources or infrastructure within the university
- managing diversified sources of funding
- unpredictable federal and state funding
- research quality, impact, and productivity
- partnerships with private industry
- broad, diverse, and increasingly cross-disciplinary research enterprise
- greater accountability
- increasing regulatory and compliance requirements
- erosion of public support for the importance of university research
- dealing with foreign influences on research

How do you see CRO positions evolving?
- Changing priorities
- Changing landscape with IT, partners, policies, etc.