PEL RESEARCH METRICS PROJECT

Aligning and Delivering Research Metrics
That Support the University's Goal of Becoming
a Top Three Public Research University

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Sponsor

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TABLE OF CONTENTS

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Many thanks to the scores of University faculty and staff who graciously gave of their time and expertise to inform our project in countless ways. A special thank you to Win Ann Schumi, our sponsor, for her continued guidance and support throughout the entire process. Without your help and input, we would not have been able to accomplish our goal of providing useful information for the next steps in the journey toward the effective measurement of research productivity at the University of Minnesota.

Cheers to you!

EXECUTIVE SUMMARY

Five members of the 2007–2008 President's Emerging Leaders cohort were charged by the Office of the Vice President for Research (OVPR) to engage university leaders in order to discover:

- the metrics that are important in measuring research productivity within their individual units,
- the metrics currently in use and others that are needed,
- the support, reporting, and information that OVPR could provide to assist academic leaders in measuring research productivity in their units, and
- the ways they would prefer to see information reported that would best facilitate the most efficient and effective use of information provided by OVPR.

This inquiry is intended to further define the university's metrics landscape in a way that accurately measures the breadth, depth, and richness of research that is conducted at the University of Minnesota. In accurately measuring research productivity, the University can clearly assess its progress in research and make pivotal decisions that will shape the course of reaching its goal of becoming one of the top three public research universities in the world. The team performed the following:

- conducted a literature review of research metrics
- discussed research metrics with University research measurement and reporting staff
- investigated commonly used university ranking systems
- examined research-related websites of comparable universities
- researched other efforts at the University tasked with measuring research productivity
- interviewed leaders in collegiate units, centers, and institutes to determine their needs for measuring and analyzing research productivity.

THE KEY FINDINGS AND RESULTING RECOMMENDATIONS ARE AS FOLLOWS:

Finding #1: ***Individual units collect research data in multiple ways but there is an expectation that OVPR is the central repository.***

University units indicated that they consider OVPR to be the central repository for a full range of research data, such as comparison data within the University, data used to benchmark against other institutions, trend data of various types by unit, data used to track interdisciplinary activity and opportunity information, and data based on grant proposal and award reporting.

Recommendation #1: ***Develop an enterprise-level system to track research metrics***

Finding #2: ***The University uses a narrow set of research metrics to track its progress toward its goal and the impact of research is not currently measured.***

Collegiate units, centers and institutes identified grants awarded, numbers of publications, and presentations (or invitations to present) as the three most commonly used research metrics. Only one of these, grants awarded, is captured at the system level. In addition, many units (especially social sciences, arts, theatre, music, and dance) indicated the predominant quantitative metrics do not meet their needs for evaluating research productivity. Furthermore, these metrics do not adequately reflect the contribution of their work to the university, our community, or to society as a whole.

Recommendation #2: ***Capture additional metrics at the system level to represent the breadth and impact of university research***

Finding #3: ***Interdisciplinary research is inconsistently defined across the University system, making measurement challenging.***

Units also indicated that while interdisciplinary research is supported and encouraged, there is little to no guidance as to how to measure its productivity. Interdisciplinary research is inconsistently defined across the system, therefore interdisciplinary research metrics are inconsistent at all levels.

Recommendation #3: ***Define interdisciplinary research and develop a standard approach for its measurement***

Finding #4: ***Unit leaders express varying levels of awareness of reports provided by OVPR, as well as varying needs for communication and discussion about research metrics.***

Generally, respondents indicated that they would like to receive research productivity information via the web so that they may retrieve it at will, in a user friendly format. They would like customized reports as well as the ability to query data to retrieve their own reports. In addition, they would like the ability to connect with OVPR on a regular basis, perhaps annually and in a group forum, to discuss best practices and other matters related to identifying, collecting, and using research metrics.

Recommendation #4: ***Create a comprehensive plan for communicating research metrics to collegiate units, centers, and institutes.***

The University's quest toward becoming one of the top three public research universities in the world is, indeed, quite an undertaking. Measurement of the impact of University research locally, nationally, and internationally is paramount in fully illustrating the University's stature. In addition, having easy access to solid research measurement information that addresses the full range of research conducted at the University of Minnesota will assist leadership in making strategic and data-driven decisions, thus informing next steps in achieving this goal.

I. INTRODUCTION

As the University of Minnesota seeks to become one of the top three public research universities in the world within the next ten years, it will become more and more important that it has appropriate and sustainable ways to measure its success, particularly as it relates to research. Critical to this effort is the need to have a unified vision of what good research metrics constitute so that a focused and sustained effort can be made towards reaching the aspired level of excellence by all units of the University conducting research.

The University of Minnesota is already one of the top public research universities and has a growing, well-balanced research portfolio that is seeing notable increases in research funding and technology commercialization. Tim Mulcahy, vice president for research, has noted in his December 2006 status of research report to the Board of Regents that "No single research metric is reflective of overall quality or prominence." This suggests that there is a diversity of metrics that measure overall quality of research.

Traditionally, research funding has been the most commonly used metric. In a climate of increasing competition among research universities for declining research dollars this will continue to be an important metric of research success of the University's efforts.

Also, historically, the Office of the Vice President for Research (OVPR) has collected statistics on the level of research activity at the University, such as numbers of proposals and awards and the level of expenditures for research activity. In addition, reports from entities such as the National Science Foundation and The Center for Measuring University Performance have provided data on comparable institutions across the country.

In addition to the areas emphasized above, the discussion of research metrics will need to be tuned to the prevailing research metrics of excellence of constituent units of the University of Minnesota. Dovetailing the efforts of research excellence measurement at the unit level with the central efforts of OVPR to measure research excellence and offering assistance in meeting the needs of the leadership in the constituent units will be a strategic way to make progress towards the goal of being a top three public research university.

PROJECT CHARGE

The project charge of the PEL Research Metrics Team was outlined as follows:

"This project will review the various metrics collected by the institution and external organizations and after careful analysis will determine what additional information related to research activity is needed in order to demonstrate that the institution is making progress toward our goal."

STATEMENT OF SCOPE

The scope of the project is to produce a final report based on research that summarizes answers to the following questions around research metrics at the University:

- What are the research metric information needs of the various units across the University?
- What are the best ways to communicate research metrics at the University?
- How is this type of information presented at comparable institutions?
- What are the best ways to collect data on research productivity by University faculty?
- What gaps exist in the data collection processes towards constructing a complete picture of the research enterprise at the University?

PROJECT OBJECTIVES

The objectives for this project were as follows:

- To identify how we define metrics of research activity required to measure our success toward achieving the University's goal.
- To determine what research metrics data and information is needed by University leadership at a unit level, to enable them to strategically address their progress toward achieving the University's goal.
- To identify what compact level measures related to research metrics are available at the unit level and what additional information is needed.
- To identify if the University is collecting the right data to be able to provide these metrics.
- To identify how research metric information can be presented in the most effective way.
- To define research metrics that are able to assess the progress and outcomes of specific University-wide initiatives such as interdisciplinary activity.

IMPORTANCE OF METRICS

The management field has an old adage: "You can't manage what you can't measure." This seems to apply to research productivity as well in that measuring research productivity and performance is critical to improving that performance. In this context the issue of quantity vs. quality came up frequently since it is much harder to measure qualitative performance than quantitative performance. Even with quantitative metrics there is the issue of what metrics are appropriate to be measured based on the discipline and unit. While recognizing that research metrics are not the last word in research productivity they play a very important role in tracking progress towards a common goal at the University.

"Not everything that counts can be counted,
and not everything that can be counted counts."

— Albert Einstein

PURPOSE OF DOCUMENT

The purpose of this document is to summarize the research of the PEL project team, including input from key leaders, and provide insights into the world of research metrics here at the University to inform the steps that OVPR may take to meet its goals of informing research productivity at the University. In addition, this document will assist others at the University, especially staff connected with measuring and setting standards for research metrics in the units, to gain an understanding of what is happening across the University system.

ORGANIZATION OF DOCUMENT

The document is organized into the following sections:

Section I introduces the project and relevant ideas, ***Section II*** covers methodology used, ***Section III*** gives insights into the background of the project. ***Section IV*** focuses on the findings of the project, ***Section V*** on the recommendations, and ***Section VI*** on the conclusion. ***Sections VII and VIII*** include references and appendices, respectively.

II. METHODOLOGY

The methodology for this report involved reviewing literature on the topic of research metrics at universities and examining ranking systems that use research metrics. Strengths and weaknesses of the most common ranking systems and productivity surveys were summarized as part of the process. (See Appendix D.) In addition, more than 40 key stakeholder interviews were conducted with University of Minnesota leadership across the various units and at the enterprise level. Selection of the interviewees was done to represent the diversity of units and disciplines even though not all units or disciplines could be covered due to time constraints. Interviewees came from three main groups — collegiate units, interdisciplinary centers and institutes, and key University-wide leadership. The interviews were conducted between December 2007 and March 2008. Most interviews were conducted by two team members, with one member primarily interviewing and the other primarily note-taking. The list of interview questions can be found in Appendix C.

III. BACKGROUND

WHAT IS RESEARCH?

Research, as broadly defined, is an organized and systematic way of finding answers to questions[1]. More specifically, "Research is scholarship, the creation of works that advance knowledge."[2] And research is one of the three major elements of the University of Minnesota's land grant mission. The University is charged with disseminating knowledge through research, instruction, and outreach activities to the citizens of Minnesota, the nation, and the world. As the University competes for dwindling financial resources and strives to improve its national and international stature among other top institutions, it is the reputation and success of our research, in its many forms, that is looked to as a fundamental measure of our overall success as an institution. The University of Minnesota strives to be one of the top three public research universities in the world and thus, "broadly recognized to be an institution where the best and the brightest can do their best work."[3]

At the University, as in most collegiate institutions, disciplinary research has had a longstanding history. Recently, however, an emerging focus on and gravitation toward interdisciplinary research has come to the fore. By all accounts, it is at the intersections of disciplines where new discoveries are made and knowledge is advanced. University leaders at all levels have used multiple descriptors to label interdisciplinary work, such as multidisciplinary, trans-disciplinary, and collaborative, in an attempt to accurately capture the breadth and variety of configurations that interdisciplinary work takes on at the University. Collegiate units across the University define interdisciplinary work differently. Some consider collaborative work conducted within departments as interdisciplinary while others do not. Clearly, work is needed to further clarify and identify what interdisciplinary work is and what it is not.

The breadth and diversity of programs comprising the University yields an equally broad and diverse approach to advancing knowledge through research activities. For example, research is conducted in laboratories, through outreach activities, and in the creation of original artistic works, to name a few. As a result, our successes are not as easily measured. Nevertheless, University leadership at all levels is grappling with ways to measure the impact and resulting productivity of University research.

[1] http://linguistics.byu.edu/faculty/hendricksen/researchmethods/RM_1_01.html
[2] Dan Dahlberg, Professor of Physics & Astronomy & Chair of Senate Research Committee
[3] Paraphrased statement from interview with Tim Mulcahy

LITERATURE REVIEW

To gain an understanding of the factors that not only influence research funding and evaluation but that are important in measuring research productivity, the Research Metrics team conducted a literature review. The review of ranking systems, productivity surveys, journal articles, peer institution websites, and granting agency websites yielded two major findings that will be discussed here. First, research institution ranking and research productivity evaluation is complex and fraught with countless opportunities for inaccuracy and subjectivism that require vigilance and intense scrutiny to assure reliability of the results. Institutions vary so vastly that establishing fair comparison of any one institution to another is difficult. Yet, these comparisons are deemed to be indicators of reputation and have a longstanding impact on future ability to attract funding, faculty, and students. Second, research funding and productivity evaluation has been biased in favor of science and engineering disciplines, focusing on quantitative measures such as expenditures and grant awards while essentially overlooking qualitative measures such as the societal impact of research findings.

RANKING SYSTEMS AND PRODUCTIVITY SURVEYS

The team conducted a review of ranking systems and productivity surveys. (See Appendix D.) The predominant ranking systems use multiple metrics to which a formula is applied in order to arrive at an overall rank by institution. Because the individual metrics and metrics groupings vary widely, the resulting institutional rankings vary from one ranking system to the next. The following systems were reviewed:

- The Center for Measuring University Performance (The Center)
- The Shanghai Report
- US News and World Report
- National Science Foundation (NSF)
- National Research Council (NRC)

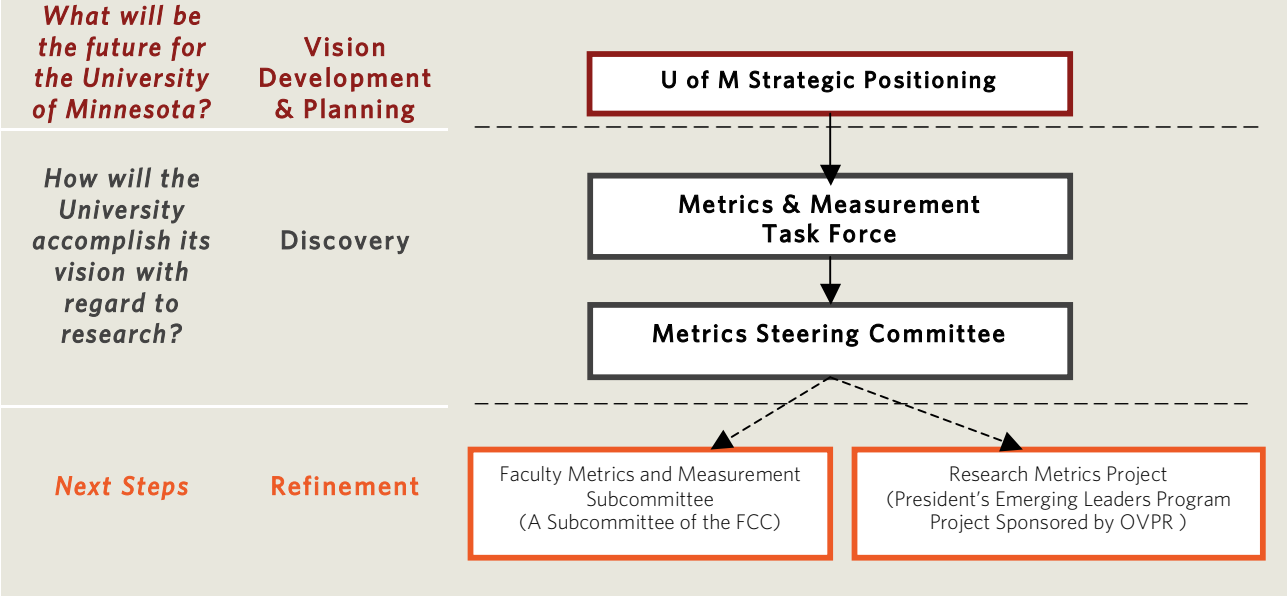
The team also reviewed productivity surveys and found that these surveys report one or more metrics but generally do not rank institutions. Instead, one may survey the quantitative results and use them to develop rankings. The following productivity surveys were reviewed:

- The Association of University Technology Managers (AUTM)
- The Association of American Universities Data Exchange (AAUDE)
- The ISI Web of Knowledge (Essential Science Indicators)
- The Faculty Productivity Index (Academic Analytics)

UNIVERSITY OF MINNESOTA RESEARCH METRICS DEVELOPMENT EFFORTS

Because research is an integral part of our mission, much work has been done to develop a centrally agreed upon set of metrics to use in measuring research productivity and gauging the University of Minnesota's research progress. This body of work has its roots in the University's Strategic Planning process and, in fact, represents the progressive steps in that process as it relates to research productivity. It is combined with a multitude of other efforts aimed at catapulting the University from its current position to within the top three public research universities in the world. It is intended to effect far-reaching and lasting change that can be viewed as a significant University movement relative to measuring research productivity. The figure below illustrates this work. More information about each group can be found in Appendix E.

Figure 1. Research Metrics Development at the University of Minnesota



The Metrics and Measurement Task Force was one of eight task forces established in 2005 to provide input and direction in the Strategic Planning process and was charged to identify the right metrics and to establish processes to best support and analyze the University's progress toward its goal to become one of the top three public research universities in the world within the next decade. At the recommendation of the task force in their May 4, 2006 report, the President commissioned the Metrics Steering Committee to address research productivity measurement. As a result, a set of six research metrics was developed (total research expenditures, federal research expenditures, national academy members, faculty awards, new intellectual property commercialization, and total active agreements) in addition to fourteen non-research related metrics. See Appendix F for the entire list of University-level metrics. Clearly, the next step in having a more complete research productivity profile for the University is to understand the metrics and indicators that are important in gauging research success in individual collegiate units, centers, and institutes, as well as of the faculty body.

Toward this end, in summer 2007 the Faculty Consultative Committee (FCC) commissioned the Faculty Metrics and Measurement Subcommittee to identify additional measures that would precisely measure the breadth of research and creative work conducted by faculty. It is the collective work of the Metrics and Measurement Task Force, the Metrics Steering Committee, the Faculty Metrics and Measurement Subcommittee, and the PEL Research Metrics Team that seeks to provide a progressively clearer picture of the state of research progress at the University of Minnesota and assist University departments in decision-making.

PEL RESEARCH METRICS TEAM CONTRIBUTION

In fall 2007, the Office of the Vice President for Research (OVPR) charged the PEL Research Metrics team with learning the following from University collegiate units, interdisciplinary centers, and interdisciplinary institutes:

1. **What is important to them in measuring research productivity.**
2. **What limitations they may be experiencing in reporting research success.**
3. **How OVPR may be helpful in providing data that will assist them in evaluating research efforts.**

While previous work had focused on institution-wide research measures, the PEL Research Metrics team focused on current compact level measures to offer recommendations for future action on the part of the Office of the Vice President for Research. The recommendations should serve as a springboard for further discussions among compact level units and with central administration that will add clarity and direction in measuring and improving research productivity.

IV. FINDINGS

In-person interviews were conducted to gather input from key stakeholders in collegiate units, interdisciplinary institutes, and centers to more thoroughly understand the issues and essential metrics related to measuring research productivity across the University system. The following results were summarized and combined into common themes based on responses that emerged from across the three key stakeholder groups. Detailed responses from each key stakeholder group can be found in Appendix G.

A. Summary of Findings from Key Stakeholder Interviews

How do you define research success?

When asked to define research success, respondents across collegiate units, centers, and institutes frequently acknowledged that while there is clearly no standard definition of research success; the idea of "impact" or "lasting importance to the discipline" was frequently referenced as the most important indicator of success. Generally respondents agree that research is successful when findings expand the breadth of knowledge in a specific discipline, when findings represent leading knowledge in the field, or when research yields higher levels of funding in comparison to other disciplines.

Specifically, how is research productivity measured?

Overall, respondents defined research productivity in terms of "tangible outputs," with quantity of publications being the most commonly cited output of research success. Publications most often noted were journal articles, book chapters, books, manuscripts, etc., with those cited in high impact journals as most desirable.

Although quantitative measures were the most common metrics of research productivity reported, key stakeholders from the humanities disciplines (e.g., art, music, theatre, and dance) frequently described research success in terms of "creative scholarship," which often includes extensive rehearsal, experimentation, and archival research not traditionally included in measuring research productivity. Respondents agreed that using standard, quantitative methods is not sufficient and does not adequately measure the contribution of these disciplines to the University and that new methods of measuring the contribution of this work is needed.

Others defined research success as the impact the work has on student learning outcomes, on the community, and our society as a whole. For example, Extension Service defines research success in terms of the impact of outreach or engagement with external partners (e.g., other community organizations or state agencies). Interdisciplinary centers, like the Center for Transportation Studies, note that research success is also measured based on how research results and best practices are transferred into real practice (e.g. MnDOT painted new markings on Hwy I-94 to reshape the flow of traffic, reduce driver conflicts, and prevent crashes).

Research success across interdisciplinary institutes was most frequently defined by:

- Number of members[4]
- Number of new collaborations
- Number of visitors as well as where visitors are from
- Level of industry buy-in
- Recognition of institute faculty
- Satisfaction of participants or attendees of hosted events

> ***"For institutes focusing on interdisciplinary research, how well faculty know one another will define how much success they will have. Having graduate students that are interdisciplinary gives an opportunity for developing a network among faculty."***
>
> *— Claudia Neuhauser, Department of Ecology, Evolution, and Behavior and Center for Learning Innovation*

[4] Many institutes have paid membership that entitles them to benefits, access to research information, and participation in activities such as conferences.

When asked how research success was defined in centers and how research productivity was measured, common measures included amounts and longevity of research funding, number of published research reports, peer review articles and proceedings, and number of websites hits. Centers also spoke of qualitative measures which help define research success. For example:

- Training, education and knowledge transfer as well as the creation of new knowledge
- New technologies that are influenced or developed as a result of the research coordinated or managed by the center
- New standards, procedures, and/or policies are developed and incorporated into practice as a result of the center's work
- Researchers take back information to their departments and convert that to new applications
- Meeting sponsor's needs in terms of deliverables

What metrics are commonly used to measure research productivity?

Measuring research productivity varies widely across the University among centers, collegiate units, and institutes, with each group using multiple methods of evaluation including both quantitative and qualitative metrics. The most common metrics are indicated in the table below.

Figure 2: Common Research Metrics at the University of Minnesota

Metrics	Description
Expenditures	▪ Amount of sponsored research funds received, particularly from federal agencies. ▪ The increase in overall expenditures annually. ▪ Expenditures per faculty, not just overall department expenditures.
Publications	▪ Number of publications (e.g., journal articles, books, etc.). ▪ Number of citations per publication, with an emphasis on the number of publications in high impact journals. ▪ Number of active pipelines in journals. ▪ Faculty or staff involvement in journal editing or the peer review process.
Proposals and Grant Awards	▪ Number of grant proposals in process and grants awarded versus proposals submitted. ▪ Total number of grants awarded with an emphasis on federally funded ones. ▪ Number of sponsored projects by unit and award dollars received per faculty.
Invitations and Collaborations	*Faculty reputation as measured by:* ▪ Invitations to speak, present, perform, or exhibit at local and national conferences. ▪ Serving on national committees and juried exhibitions. ▪ Serving on federal grant review panels. ▪ Invitations to collaborate on interdisciplinary research projects. ▪ Type and number of collaborations.
Indirect Cost Recovery (ICR)	▪ The amount and percentage of ICR received. ▪ Trends in indirect cost recovery levels.
Faculty Reputation	▪ The number and type of scholarly nominations, honors, and professional awards received at local, national, or international levels.
Student Engagement in Research	▪ The quality of graduate student applications. ▪ Number of graduate students. ▪ Number of graduate degrees awarded. ▪ The success of graduates. ▪ Graduate expenditures. ▪ Number of post doctoral students. ▪ Number of undergraduates engaged in research.
Space Allocation	▪ The function of space as it relates to conducting research. ▪ Funding generated per square foot especially for medical research facilities.
Other Measures	▪ Translational research conducted. ▪ Patents and licenses received.

A primary reason institutes at the University capture data related to research productivity is to prove the value of their institute, not only by comparing it to similar institutes nationally, but to demonstrate its added value to collegiate units at the University. Below are additional measures of research productivity reported by respondents representing interdisciplinary institutes.

- Renewal rates
- Attendance at public lectures and conferences
- Number of seminars conducted
- Number of graduate students trained
- Number of agencies involved in a project

How is the data captured?

There is no consistent, University-wide method for gathering data related to research productivity. The most common self-report tool is the Faculty Activities Report (FAR). Information captured by the FAR is most commonly used by leadership to make decisions about tenure, merit increases, and promotion as part of the annual performance review process. Examples of unique methods used to capture faculty activity are:

- Extension Service captures data via the budget process and from federal reports.
- Some collegiate units use Levels & Trends reports produced by OVPR.
- Medical School is developing the h-index, a modified citation index, which measures the correlation between laboratory space and publications in high visibility journals.
- College of Education and Human Development developed an electronic system for faculty to track the impact of their work, level of scholarship, and engagement, among other qualitative measures of impact based on the college's mission.

How is the data used?

Research productivity data is primarily used to assist leadership in making decisions related to reporting, for strategic planning, and to assist them with management and operations planning. Examples of these are listed below.

- ***For Reporting Purposes:*** Supplying data for completion of national surveys such as the National Science Foundation (NSF), the National Research Council (NRC), and US News and World Report. Data is also provided to the OVPR for communicating progress in annual reports, reporting to accrediting bodies and national associations, and for reporting to department chairs at monthly meetings.
- ***For Strategic Planning:*** For internal decision-making and establishing goals, measuring overall productivity to determine how efficiently research funding is allocated, and to build a reputation to enhance their ability to obtain new grants, patents, and licenses.
- ***For Operational Decisions:*** For capital and building requests, allocating ICR, and for space allocation.

Institutes primarily use data to demonstrate their value to a broad base of internal key stakeholders (e.g. the Provost, President, colleges, department heads, fellows, etc.) and external key stakeholders (sponsors, federal funding agencies, and/or other community agencies). Institutes also use data to evaluate the impact of their work on researchers' careers and to verify their worth by comparing themselves to similar institutes at other academic institutions.

Do you have research requirements for faculty and research staff? Are there different requirements depending on the faculty or staff rank?

Clearly there is an expectation that all tenure and tenure track faculty should be engaged in scholarship. Overall, respondents spoke in terms of broad research expectations or milestones rather than specific requirements, with several respondents indicating that there are no quotas. There are measures of quantity (e.g., number of publications) as well as measures of impact (e.g., letters of recognition, serving on review panels, conference presentations, exhibits at national and international venues, etc.). Overall, responsibility increases with advancement of faculty rank. Respondents referred to the requirements outlined in each unit's 7.12 statement. There was no consistent method for capturing data for faculty across the system. Only a few respondents indicated research requirements for staff.

What are your future goals for increasing research productivity in your college/unit?

An increase in publishing and grant activity is of primary importance and strongly encouraged across collegiate units, centers, and institutes, but future goals are not formalized. Phrases like "to improve" or "maintain" the current position were often used to describe future research goals. Units are primarily focused on increasing administrative staff support to facilitate faculty research activities.

Interdisciplinary institutes and centers are primarily concerned with acquiring additional personnel, facilities, and space, essential for continued growth and sustainability. Physical space, in particular, is a significant concern. Centers are often considered a launching pad for capturing grant funds. Additional space is required not only to pursue a large grant but also to convene faculty collaborative research once a grant is funded.

Is there a planned percentage increase related to future research productivity goals?

Some units had specific increases in mind but often did not have specific measures or methods to measure their progress related to reaching those goals. For examples of long range planning research goals shared by selected collegiate units see Appendix G, page 4 of Theme Analysis – Associate Deans and Department Heads.

What are the specific indicators used to determine if you are accomplishing your research goals?

Many of the same metrics mentioned previously are also being used to measure research goals, including number of grants, amount of funding awarded, number of papers published, number of students/faculty winning national awards, among others. Below are several examples of benchmarks used by specific collegiate units to determine if they are accomplishing their research goals.

- **CEHD uses financial growth indicators — overall sponsored activity, an increase in ICR resources and land grant commitment — working for the public good, supporting county and state agencies.**
- **Departments in the arts and humanities track the numbers of students or faculty who are invited to perform or present their products/exhibits at highly-recognized local, national, or international venues. Another indicator of success is the receipt of awards such as the MacArthur, Guggenheim, American Academy of Rome, Bush Foundation, or the Preda Rome Prize.**
- **A benchmark used by Extension Service is the ability to gain funding through the Ag State Special, a legislative request independent of the University's regular request process.**

How is interdisciplinary research activity conducted and measured in your college/unit? Is the research conducted across colleges or within each college/unit? Please explain.

Overwhelmingly, respondents agreed that the University has successfully created a climate that fosters interdisciplinary research both within the collegiate units and across the system. Clearly a significant amount of interdisciplinary research is being conducted and is strongly encouraged at all levels of the University.

Interdisciplinary research most recognizably takes place between colleges, departments, and disciplines at the University of Minnesota, and with less reported frequency nationally and internationally. Definitions can vary widely primarily since interdisciplinary research takes on various forms and involves a wide range of collaborative activities. For example, faculty members may have a joint appointment, or they can come together informally with different areas of expertise, or they can work directly with other institutions. Due to the variable nature of these collaborative relationships and because interdisciplinary research is defined differently across the system, respondents acknowledged there is no convenient method for measuring collaborative research.

Common definitions of interdisciplinary research were as follows:

- **The Medical School defined interdisciplinary research as "More interdisciplinary than intra-disciplinary research."**
- **Several respondents described their work as "multidisciplinary." For example, CEHD uses the term to describe the college's approach to research that is centered on the college's neighborhood or block concept. Neighborhoods bring partners together in a research environment. Blocks have more than one unit involved from across the college or university. An internal indicator is to increase ICR support to higher than 14%.**

- The School of Nursing defined interdisciplinary research as that which involves work with other disciplines either across collegiate units, Academic Health Center schools, or with external partners (e.g. community based organizations or state agencies).
- "Trans-disciplinary," a term used by the Institute on the Environment, refers to a collaborative approach to assembling a working community of scholars representing many disciplines from across the system.
- Centers work across colleges within the University, across centers and communities, and in some cases with other universities and with other non-university organizations, sometimes at the national level.

Although there are no significant barriers to conducting and advancing collaborative research, respondents agreed there is no road map for doing interdisciplinary research. Units tend to have their own unique process for coordinating information and no formal system exists to help faculty learn about other faculty who may be engaged in similar research across the campus. Respondents indicated that a critical part of enabling interdisciplinary research is bringing faculty and staff together to connect with each other to learn about other areas of expertise and to develop alliances that are necessary for conducting collaborative research.

"Nobody is as smart as all of us."

— Author Unknown

What challenges, if any, do you face with measuring interdisciplinary research at the U?

With no standard definition or formal method for tracking interdisciplinary research system-wide or even within the departments, there is uncertainty about how to consistently measure interdisciplinary research. Barriers associated with measuring interdisciplinary research most frequently focused on identifying, tracking, crediting, and funding individual efforts in the collaboration. Below are some of the specific challenges respondents reported related to measuring interdisciplinary research..

- At the University we have the "silo effect," with differing standards in each department and in each college. Interdisciplinary projects may involve participants with reporting lines to multiple supervisors or vice presidents. In centers, identifying research success metrics is challenging since what constitutes success can vary widely depending on a researcher's appointment or discipline.
- Negotiating the contributions and recognition of people collaborating on interdisciplinary work is hard to tease out. Measuring authorship of publications, including who is involved and where they are from, is a common challenge.
- Sharing ICR is challenging, requiring considerable negotiation across departments.
- Measuring interdisciplinary research solely with quantitative measures is not sufficient. Using a narrative or other mechanism is needed to clarify and interpret quantitative metrics.

Do you compare your college to similar colleges at other universities? If yes, which universities and how do you compare yourselves?

Benchmarking against other institutions is common practice among centers, institutes, and collegiate units, but comparisons differ widely and vary by college or discipline. Collegiate units generally compare themselves to peer institutions or other Big Ten schools and other recognized institutions or programs in their respective fields, but less so to the institutions that are identified as our aspiration group or to other University departments. Institutes and centers at the University often compare themselves to institutes at other large universities nationally or internationally. Most of these comparisons are unique depending on the field of study and tend to be informal.

What metrics are used? Are there any formal or informal processes used?

Benchmarking is often ad hoc, discipline based, and not systematic. The most commonly used metric is sponsored research funding. Only a few colleges indicated specific metrics they use when benchmarking against similar institutions. For example,

- **The Academic Health Center schools include level of NIH funding, National Academy memberships, recipients of prestigious awards, and data from national associations such as the American Association of Medical Colleges (AAMC).**
- **Psychology examines qualitative measures related to the "impact factor," such as whether they work on and make progress on important problems, contributions to the field, and what kind of graduate training and opportunities are provided.**
- **The Medical School examines the "match range" data for four year medical students[5].**
- **In CFANS, the Intercollegiate Studies Institute (ISI) uses a formal process to compare different disciplines in the college to those at other national and international institutions, including private universities, government agencies, and international entities. Metrics measured include papers published and citations.**
- **The Carlson School uses an external review of unit programs by a research panel made up of deans of other schools, participation in or presenting at major academic conferences, presentations at other schools, and editorial board membership.**

[5] The match range shows how often highly desirable students also select the University as their highly ranked choice of school to attend.

What type of reports or information do you need from OVPR to help you gauge your progress related to measuring research productivity in your college?

Units are looking to OVPR as a gatherer and consolidator of data from across the University. They are interested in examining trends in areas that are of particular importance to them. Below are the primary reports and information respondents indicated they would like to have from OVPR to more effectively measure research productivity.

- ***Provide research data to facilitate comparisons across the University and with other institutions:*** Respondents are interested in how they are doing at the faculty, unit, and department levels related to specific research metrics and many would like to conduct trend analysis to examine progress annually. They also want to examine trends in funding sources over time to determine how best to pursue future funding.
- ***Provide leadership related to information about interdisciplinary activities:*** The OVPR is seen as a centralized place for information on interdisciplinary activities and respondents are looking for more streamlined methods for tracking and reporting interdisciplinary research activities. Specifically, units would like to track patterns of collaboration and interdisciplinary research efforts (e.g., who is working with whom). In addition, respondents are interested in information about currently funded research that is searchable by amount, percent of ICR, faculty member by discipline, names of PI's and co-PI's, and "hit rates" of submissions versus awards. Respondents are also looking for more accurate methods of tracking indirect cost recovery (ICR) on sponsored activity and division of ICR when it is shared with other colleges.
- ***Assist units with understanding the SPA data base:*** Respondents would like the SPA data base to be more transparent and to better understand the system. Several respondents noted that the expenditure data is good but award data is imprecise—numbers, duration, etc., are difficult to decipher.
- ***Provide additional reporting features:***
  - Percentage of faculty involved in research
  - Quarterly reports on patents and licensing and intellectual property
  - Information on faculty citations, both national and international, citation counts, and other measures of research productivity used in associated disciplines
  - Information on the impact factor of journals (e.g., cumulative impact by faculty member)
- ***Enhance reporting of grant proposals and awards:*** In addition to raw numbers of grants submitted and awarded, expenditures, etc., units also requested a greater degree of granularity, with information broken down by department, level, and PI. Other grant reporting needs include:
  - More longitudinal data and ready access to information about new and follow-on, internal and external funding opportunities
  - Number of proposals submitted, accepted, grants continuing, and expenditures
  - Analysis on grants activity including NIH funding trends
  - Data related to what is being funded, who is being funded, how much, when it started and ended

- Follow-up information on how grant money is used to demonstrate productivity and value to funding agencies
- Provide more accurate methods of tracking Indirect Cost Recovery (ICR) on sponsored activity and division of ICR when it is shared with other colleges: OVPR can facilitate discussions about best practices for measuring research productivity and best practice ideas for sharing ICR. A suggestion was made to use time during Council of Research Associate Deans (CRAD) meetings.

- ***Promote the use of data for sustainability for centers:*** Using data to promote sustainability is critical since base funding is the greatest challenge for centers. Once base funding is secured, efforts can then focus on measuring research productivity.
- ***Improve the accuracy of data housed in the data warehouse:*** A number of respondents indicated that data from the data warehouse is incorrect and does not accurately reflect the current activities of the individual collegiate units or institutes. Data presented is not always of the same timeframe. Some are not sure of the source of the data and indicated that they are unclear about where the data goes. Others noted repetition of data gathered.
- ***Develop a central database:*** Develop a data management system that would capture a universal set of quantitative metrics from across the units, centers, and institutes which would also allow for unique data entry and queries. This system would allow OVPR to capture common data elements centrally but also allow individual units to download unique data elements specific to their reporting needs.
- ***Improve data reporting related to facilities and space:*** Enhanced tracking and crude data on facilities and research space by awarded research dollars would allow for better methods of determining cost per square foot to increase efficiency. Tracking mean research dollars per square foot and productivity per faculty would also be useful for researchers.

In what format would you like to receive this information and how often would you like to receive this information?

Respondents made the following suggestions:

- Increase frequency of reports and provide in formats that are more user friendly.
- Provide an annual report that is printed and bound and delivered with a personal touch, perhaps presented in an open forum with groupings of peers.
- Produce reports on-line, as well as a combination of prepared reports and canned queries.
- Provide information when it is updated, make units aware of when the data is updated, and provide the information quarterly.
- Create more targeted reports.

METRICS CAPTURED BY UNITS

A summary of the research metrics identified in interviews with members of the Council of Research Associate Deans (CRAD), directors of selected institutes and centers, and heads of several large departments can be found in the table in Appendix H. Almost across the board, publication — whether books or articles or chapters — and significant awards are counted as measures of research success.

B. Findings from Website Reviews

OVPR WEBSITE: LEVELS & TRENDS

The website of the Office of the Vice President for Research at the University of Minnesota is located at *http://www.research.umn.edu*. Information that is relevant to research metrics is found in the Levels & Trends section of the site. The data in this section is collected in support of the Vice President's annual report to the regents.

Reports consist of:

- **Sponsored expenditures (by college, agency, trends)**
- **Proposals and awards (by college, agency, trends)**
- **Rankings (federal obligations, R&D expenditures in science and engineering)**
- **Patents and licensing**
- **Expenditures by department/area**

Reports are presented in pdf or excel format. Someone using the department/area spreadsheet is able to see how their area, including interdisciplinary centers, compares to all the other areas at the University in research expenditures for the most recent fiscal year. Custom reports cannot be generated. Very little explanatory text is included.

Several ideas for improvement of the reports or additions to the website were mentioned during the interviews. These include:

- **More robust experts database, searchable by topic, to assist in interdisciplinary efforts**
- **More detail at departmental level; more historical data**
- **Information about other institutions, including best practices for measuring research productivity.**

RESEARCH WEBSITES AT PEER INSTITUTIONS

In its May 2006 report for the Strategic Positioning initiative, the Metrics and Measurements Task Force identified a comparison group of ten institutions for the Twin Cities campus. These institutions are to be used in benchmarking the progress of the University toward its goal of becoming one of the top three public research institutions in the world. Four of the institutions (University of California – Berkeley, University of California – Los Angeles, University of Michigan – Ann Arbor, and University of Wisconsin – Madison) have traditionally ranked at the top in ranking studies; these are considered our "aspiration" group. The other institutions, our peers, are also highly ranked land-grant institutions and are similar to the University in mission, academic offerings, and size of student body.

Figure 3: Comparison Institutions Used in Benchmarking

Comparison Group
Ohio State University – Columbus
Pennsylvania State University – University Park
*University of California – Berkeley**
*University of California – Los Angeles**
University of Florida
University of Illinois – Urbana-Champaign
*University of Michigan – Ann Arbor**
University of Texas – Austin
University of Washington – Seattle
*University of Wisconsin – Madison**
**aspiration group*

The PEL team reviewed the websites of the top research office at each institution in the comparison group to determine how they are communicating vital information to their internal audiences, including those individuals who are responsible for strategic planning within colleges and other units as well as faculty researchers who are applying for grants, managing their grants, or seeking collaborators. Notable examples of presenting relevant information have been grouped into three categories: dynamic reporting systems, presentation of information and instructions, and demonstrating the impact of research.

- ***Dynamic proposal and award reporting.*** **Many peer institutions have developed dynamic databases that allow users to generate custom reports on proposal and award activity using criteria such as investigator, college, department, time period, sponsor, etc.**
  - Ohio State University's eActivity system allows users to save this data to Excel for additional manipulation. (*http://rf.osu.edu/e-activity/index.cfm*)
  - University of California – Berkeley's COEUS system is described as "a repository for management and decision support information." The publicly accessible part of the system provides summary figures; there is a password protected portion with, presumably, a greater level of detail and sensitive information. (*http://coeus.spo.berkeley.edu/about.html*)
  - Penn State has developed the Strategic Information Management System (SIMS). According to the website, SIMS features real-time reporting, offers the ability to perform extensive trend analysis at the university, college, and department levels, and enables colleges/departments to enter proposal data directly into the system. Access is not available outside of the Penn State University system. (*http://www.psu.edu/president/pia/spotlight/sims/index.html)*

- The University of Florida's proposal/award database gives users the ability to select the information they want and provides a choice of report formats. (*http://apps.rgp.ufl.edu/research/search/*)
- The University of Michigan's PRISM (Programmed Research Information System at Michigan) offers 17 predefined queries and reporting formats; all searches and formats can be user-defined and downloaded. Information is updated nightly. Access is password protected. (*http://www.research.umich.edu/proposals/prism/prism.html/*)

- ***Information and instructions presented in a user-friendly format.*** **Interviews with key stakeholders at the University of Minnesota revealed some uncertainty about how to use the information that is presented in Levels & Trends. The following peer institutions do an excellent job of providing instructions for administrators to assist them in interpreting and generating research metrics reports.**
  - The University of Michigan's PRISM site has an extensive FAQ section on using the system.
  - Berkeley's COEUS website includes a description of each report that can be generated, brief instructions for key fields, and a contact name for questions about the report.
  - The Research Foundation website at Ohio State University contains levels and trends reports that are easier to access and use than those found on the OVPR web site at the University of Minnesota. Ohio State reports are found directly on the main web site in the left hand navigation bar. A click on the "Reports" section reveals annual audits from the past few years, annual reports dating back to 1997, monthly summaries of awards and expenditures dating back to 1997, numerous benchmark comparisons within and external to Ohio State, and NSF R&D expenditure reports. (*http://rf.osu.edu/reports/*)
- ***Documentation of research impact.*** **In addition to quantitative measures of research productivity, many respondents spoke of qualitative aspects and the importance of "impact" as a measure of research success. The following peer institutions in particular have used their websites to demonstrate the impact of their research.**
  - The University of Texas at Austin takes a different approach to research reporting than the other institutions. Instead of focusing on data, its website has sections devoted to news, featured projects, researcher profiles, research impact, and student research. Each section contains feature stories and archives. Similarly, its latest Report on Research (2005) is web-based, with few of the typical research facts but extensive sections devoted to stories in the categories of making discoveries, investing in research, highlighting key research, earning recognition, building for the future, and working together. (*http://www.utexas.edu/research/index.php*)
  - The University of Wisconsin demonstrates its statewide impact with the Idea in Action, a searchable database currently listing 663 projects representing partnerships with businesses, organizations, and communities across the state. (*http://searchwisconsinidea.wisc.edu/index.pl*)
  - The University of California – Los Angeles and the University of Washington have both developed annual research fact sheets, measuring just 8-1/2 x 11 double sided, that are attractive, colorful, and easy to download from their websites. Each contains a summary of research funding, sources of funding/awards, a list of major faculty

prizes, honors and awards, a selection of major grants received, and other information. UCLA has a section devoted to "Economic Impact" and Washington highlights "Economic and Educational Impact." A list of leading research centers further demonstrates the breadth, and potential impact, of research at each institution.
(*http://www.ovcr.ucla.edu/documents/UCLAResearchFactSheet2008_000.pdf*);
(*http://www.washington.edu/research/or_doc/fact.pdf*)

V. RECOMMENDATIONS

Finding #1: ***Individual units collect research data in multiple ways but there is an expectation that OVPR is the central repository.***

University units indicated that they consider OVPR to be the central repository for a full range of research data, such as comparison data within the University, data used to benchmark against other institutions, trend data of various types by unit, data used to track interdisciplinary activity and opportunity information, and data based on grant proposal and award reporting.

Recommendation #1: ***Develop an enterprise level system to track research metrics.***

An enterprise level system would be a centralized database that would gather data from multiple sources and track all elements relevant to research productivity at the University. Currently, there is no comprehensive system in place, and research productivity is tracked differently by collegiate units, centers, and institutes. Not all the best indicators of research success are currently being tracked at the system level (e.g., publications, citations, presentations). Since no single metric can successfully track the University's progress to achieving its goal, this recommendation indicates a broad set of metrics is the best tool to measure progress.

CONSIDERATIONS FOR BUILDING A COMPREHENSIVE DATABASE OF RESEARCH PRODUCTIVITY METRICS

Creating a comprehensive database of research metrics is a tall order. Building it would be akin to creating a machine that already has many fully-functioning cogs in place — cogs that currently provide many of the above benefits to some users of this data. Some elements of such a database are already in place, and the new Enterprise Financials System (EFS) in PeopleSoft will consolidate these even further. Levels & Trends provides summary data of research productivity University-wide. University employees can query the Data Warehouse for information pertaining to grant proposals, grant expenditures, and grant awards. Also, many units currently have their own processes in place for tracking and reporting research productivity (Carlson School and Medical School) while other units are on the verge of instituting systems that would perform such a function (College of Design and College of Food, Agriculture, and Natural Resource Sciences).

First and foremost, a comprehensive database must meet the business needs of those who use it. It must be especially sensitive to those who currently use their own systems to serve their own unique data tracking needs. It must be easy and intuitive to enter data and to track information important to units, department heads, and faculty. In order to be successful, this database should:

- Track data important to the units (refer to metrics matrix)
- Offer reports in a way that makes it easily comparable to other data sets (e.g., fiscal vs. calendar vs. academic year)
- Be easier for units to use than existing tools
- Reap more benefits for units than existing tools
- Be easy to use and valuable for the person responsible at the point of data entry
- Be of clear value for faculty self-reporting their own research productivity information
- Provide reports that are useful to units, departments, and faculty
- Allow free-form queries

BENEFITS OF A COMPREHENSIVE RESEARCH PRODUCTIVITY DATABASE

Methods to compare the University to other universities are limited to various ranking systems or rankings of external funding (e.g., federal grant funding ranking systems). Such ranking systems have significant limitations because they don't do a good job of comprehensively measuring research productivity. While OVPR leadership encourages using a narrative approach to communicate the value of research productivity to the public, at the system level, a comprehensive database will

- demonstrate the value of the University's research efforts to all stakeholders
- blend research metrics with other data at the University to help show efficiencies of units, departments, and faculty
- provide University leaders with data to ensure accountability for the use of resources. For example, reports that link sponsored funds with usage of University space could indicate how wisely space is used at the University (ideally at the unit, department, and faculty level).
- allow for a broader presentation of research success at the University.

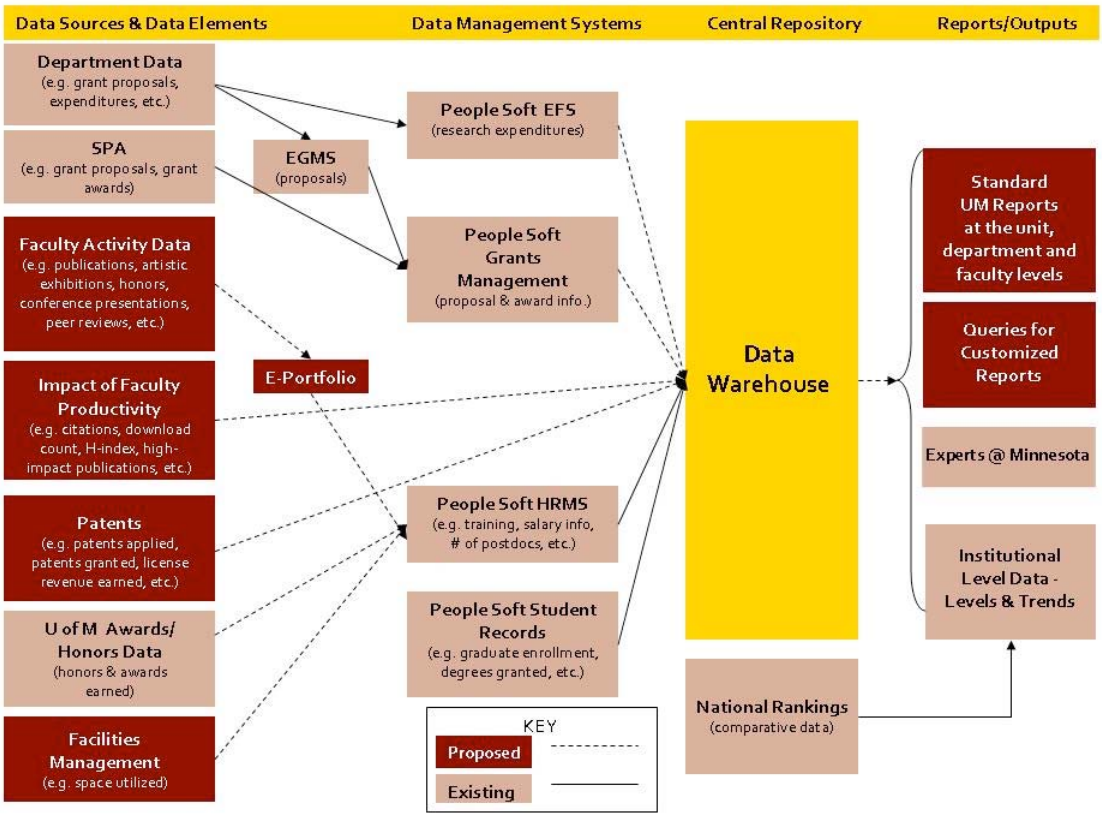
Collegiate units, centers, and institutes have their own strategic goals, and many of these goals are based on research productivity. A comprehensive data system set containing indicators of research productivity would:

- enhance the ability for units to measure progress towards reaching their goals and compare their progress to their peer departments
- provide units with a better source of information on which to base unit-wide decision making, such as the hiring of faculty, adding of space or equipment, or channeling of resources to departments or faculty
- allow departments to do a better job of distributing scarce resources among faculty, ensuring that successful faculty obtain the resources they require, and limiting the resources provided to faculty who are not using them productively
- provide a more specific set of data for units to communicate their value to the public
- place Faculty Activity Reports (FARs) online, and replace multiple FARs systems currently in place. The e-portfolio system at the University might be a good model for such a system — while it is currently tailored for student use, a version specifically for faculty use may be helpful.

- help faculty demonstrate their progress and result in recognition of their efforts in the form of pay raises, awards and honors, promotion and tenure, and more. If all faculty activity is entered into this dataset, the result is a live, potentially interactive, real-time curriculum vitae.
- be of great use to the media in search of experts on certain topics and help researchers looking for collaborators on research projects. This could help make "Experts@Minnesota" a more comprehensive and valuable tool.

The endeavor to create such a system would surely use a significant amount of resources. Implementation would be time intensive, and require a careful analysis of business processes in place and reporting needs of units and departments. This system will need to draw data elements from many different points (see below). As indicated above, however, it can provide clear value at many different levels in the University.

Figure 4. Proposed Flow of Research Productivity Data



Finding #2: ***The University uses a narrow set of research metrics to track its progress toward its goal and the impact of research is not currently measured.***

Collegiate units, centers, and institutes identified grants awarded, numbers of publications, and presentations (or invitations to present) as the three most commonly used research metrics. Of these, only grants awarded is captured at the system level. In addition, many units (especially social sciences, arts, theatre, music and dance) indicated the predominant metrics do not meet their needs for evaluating research productivity. Furthermore, these metrics do not adequately reflect the contribution of their work to the university, to our community, or to society as a whole.

Recommendation #2: ***Capture additional metrics at the system level to represent the breadth and impact of university research.***

Most colleges and units track faculty publications, including books, chapters, journal articles, and online publications, through their Faculty Activity Reports or other self-reporting mechanisms. In addition, departments in the arts and humanities consider performances, exhibitions, and creative productions as a measure of research productivity. And centers and institutes often use attendance at their symposia and programs as a measure of their research productivity.

Future efforts need to focus on bringing representatives from these disciplines together to develop new, innovative ways to more accurately measure the positive impact, including the value these non-science disciplines bring to the university, our community and society as a whole.

The Office of the Vice President for Research, working in cooperation with the Vice Provost for Faculty Affairs, should aggregate information from the Faculty Activity Reports, including faculty publications and other measures of research productivity identified by units.

> *"A book is the coin of the realm."*
>
> *— Roland Guyotte,*
> *University of Minnesota, Morris*

BENEFITS

Capturing publications, performances, exhibitions, memberships, and attendance at the system level would be more inclusive of all disciplines at this complex institution and would provide a more comprehensive picture of the state of research at the University. Capturing the impact of research would also demonstrate the value of our work at local, national and international levels.

Finding #3: ***Interdisciplinary research is inconsistently defined across the University system, making measurement challenging.***

The PEL team's investigation found few significant barriers to pursuing interdisciplinary research; however, no respondents indicated they were able to successfully measure it. The reason behind this is that interdisciplinary research is not well understood or defined. It can currently be understood to mean several things:

- collaborative research (multiple PIs)
- intercollegiate research (between colleges)
- interdepartmental research (between departments)
- interdisciplinary research (between academic disciplines)

Recommendation #3: ***Define interdisciplinary research and develop a standard approach for its measurement.***

In order to measure this type of research, a common definition must be established. The most convenient and valuable way is to define it as "Collaborative Research," or research with more than one PI. Projects contain multiple PIs because they require the expertise of researchers in different disciplines. The location in which the researcher is employed (college, department, or university) has not been found to be an important factor when evaluating whether research crosses disciplines.

BENEFITS

Establishing a common definition of interdisciplinary research will allow it to be consistently measured. Identifying metrics and collecting them at the system level will give credit to those involved in interdisciplinary research.

Finding #4: ***Unit leaders express varying levels of awareness of reports provided by OVPR, as well as varying needs for communication and discussion about research metrics.***

Generally, respondents indicated that they would like to receive research productivity information via the web, in a user friendly format, so that they may retrieve it at will. They would like customized reports as well as the ability to query data to retrieve their own reports. In addition, they would like the ability to connect with OVPR on a regular basis, perhaps annually and in a group forum, to discuss best practices and other matters related to identifying, collecting, and using research metrics.

Recommendation #4: ***Create a comprehensive plan for communicating research metrics to collegiate units, centers, and institutes.***

Many respondents indicated that the information contained in the Levels & Trends section of the OVPR website does not adequately meet their needs. Levels & Trends should be expanded to include:

- More granular information, e.g., proposals and awards broken down to the departmental level not just the collegiate level
- More longitudinal information, e.g., expenditures by department/area for previous years in addition to current year
- Information about interdisciplinary research activity, specifically a record of collaborative efforts

- Quarterly reporting of patents and licensing activity
- More information related to research metrics at peer institutions

However, simply making this information available online is not enough. Following the examples at peer institutions, the OVPR could do a better job of presenting the data and helping users understand how to use it. The Research Metrics team recommends the following improvements:

- an FAQ section
- context for the information that is presented. The OVPR collects information for its purposes; a user may note discrepancies if they are trying to adapt the information to another purpose.
- a direct link from the Research and Scholarship tab on the myU faculty portal to appropriate parts of the OVPR website
- a fact sheet similar to UCLA's and Washington's, prepared in cooperation with the Provost's Office and University Relations
- using the Experts@Minnesota database to highlight the impact of University research

In addition, the OVPR needs to take a proactive approach to ensure that research associate deans and other collegiate administrators know what information is available and that they understand how to use the reports and various grants management tools. Regular training opportunities should be offered, especially for research administrators at the collegiate and department level, particularly those who are new to their positions. This should be supplemented with ongoing communications about the state of research activity at the University and with an annual retreat or similar forum devoted to the topic.

BENEFITS

The recommendations for expanding the Levels & Trends website came directly from interviews with associate research deans and the heads of major centers and institutes. By implementing these recommendations, the OVPR will demonstrate that those voices are being heard and that central administration is willing to provide deans and heads with the management tools they need to improve research productivity at the unit level.

By providing training and regular communications about research metrics, the OVPR will:

- Solidify its position as the leading research office at the University
- Reduce errors in reporting research data at the unit level
- Enable everyone to hear the same message
- Help deans and other research administrators make informed decisions and set realistic goals.

Finally, by sponsoring an annual retreat or forum the OVPR will facilitate a discussion of best practices across the system and foster a sense of common purpose related to measuring research productivity.

Together, these efforts to improve communications will facilitate a clear understanding across the system of the University's progress toward its goal of becoming one of the top three research institutions in the world.

VI. CONCLUSION

Over the past two years, the Office of the Vice President for Research (OVPR) has implemented new programs and spearheaded initiatives to advance the productivity of research efforts at the University of Minnesota. In addition, recent work (see Appendix E) in identifying relevant research metrics has led to the development of centrally agreed upon metrics by which research productivity is to be measured at the institution level. However, compact level productivity measures and indicators had not been explored. The OVPR recognized that it did not have the complete research productivity measurement picture and asked the PEL Research Metrics team to find out the following from collegiate, center, and institute leadership:

- **the metrics that are currently being used**
- **metrics that units think are important to begin using**
- **data and reports that OVPR could provide to assist units in measuring research productivity and in decision-making related to research**

The team analyzed their findings and developed recommendations to assist OVPR in better partnering with compact level units to accomplish University research measurement and productivity goals. The analysis yielded one very remarkable finding. Although the University seeks to define and refine the measurement of research productivity and outcomes, ultimately the importance of our research measurement efforts lies in highlighting the impact of our research on our disciplines, our community, and the world. It is from the standpoint of research impact that the University will be able to more comprehensively grasp the importance of research contributions made by all disciplines across the campus.

Armed with knowledge gained from the findings and resulting recommendations of the PEL Research Metrics team, OVPR can further assist compact level units in establishing consistent methods, practices, and protocols for measuring research productivity. With a transparent and systematic process in place for assessing the current state of research efforts, determining trends and guiding decision-making, the ensuing successes of individual units become the building blocks of the University of Minnesota's position as one of the top three public research universities in the world.

> *"Whatever we measure we tend to improve."*
>
> *— David Leach*

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WEB-BASED RESOURCES AND REPORTS

Academic Analytics, Academic Analytics, Faculty Scholarly Productivity Index *http://www.academicanalytics.com/*

Academic Ranking of World Universities Shanghai Jiao Tong University *http://ed.sjtu.edu.cn/rank/2007/ranking2007.htm*

Academic Research and Development Expenditures: Fiscal Year 2006, National Science Foundation, *http://www.nsf.gov/statistics/nsf08300/*

AUTM U.S. Licensing Activity *Survey* FY 2007 *http://www.autm.net*

Carnegie Classification of Institutions of Higher Education *http://www.carnegiefoundation.org/classifications/*

Centre for Higher Education Development *http://www.che.de/cms/?getObject=305&getName=Working_method&getLang=en*

Criteria for Tenure and 7.12 Documents *http://www2.cla.umn.edu/admin/faculty-research/CLA7.12Statements.html*

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APPENDIX A: PROJECT CHARGE

OFFICE OF THE VICE PRESIDENT FOR RESEARCH

Aligning and Delivering Research Metrics That Support the University's Goal of Becoming a Top Three Public Research University

Introduction

As the University seeks to become one of the top three public research universities in the world within the next ten years, it will become more and more important that we have appropriate and sustainable ways to measure our success, particularly, as it relates to research. So the question is how do we measure excellence in research activity?

As Tim Mulcahy, Vice President for Research, noted in his December 2006 status of Research report to the Board of Regents, "No single research metric is reflective of overall quality or prominence". His report showed that the university remains one of the top public research universities and has a growing, well-balanced research portfolio that is seeing notable increases in research funding and technology commercialization. However, competition among research universities for declining research dollars is increasing significantly; therefore the university must continue to work aggressively through its strategic positioning efforts and initiatives to compete successfully for research dollars.

For many years, The Office of the Vice President for Research had collected statistics on the level of research activity at the University, such as numbers of proposals and awards and the level of expenditures for research activity. In addition, reports from entities such as the National Science Foundation and The Center for Measuring University Performance, provide data on comparable institutions across the country.

This information is helpful but what information does our university leadership need to help them determine if we are making progress toward our goal of being a top 3 public research university?

Project Statement

This project will review the various metrics collected by the institution and external organizations and after careful analysis will determine what additional information related to research activity is needed in order to demonstrate that the institution is making progress toward our goal.

OBJECTIVES

- How do we identify or define metrics of research activity required to measure our success toward achieving this goal?
- Determine what research data and information is needed by university leadership, such as college deans, to enable them to have the information they need to strategically address their progress toward achieving this goal.
- What compact level measures related to research metrics, do the colleges have, what else is needed? Is the institution collecting the right data to be able to provide these metrics?
- How can research metric information be presented in the most effective way.
- Define research metrics that are able to assess the progress and outcomes of specific University- wide initiatives such as Interdisciplinary activity.
- Enable the OVPR to provide better information to deans and senior leadership to support their decisions relative to strengthening the research enterprise.

SUGGESTED TASKS OR METHODS FOR ADDRESSING THESE OBJECTIVES:

- Conduct interviews and focus groups with University leadership, such as deans, to ascertain their needs for research metric information. Make recommendations on best method for delivering this type of information to deans based on these interviews.
- Determine appropriate ways to communicate research metrics, including reviewing and making recommendations for the OVPR's web site that present data on level and trends in research at the University of Minnesota.
- Research how this type of information is presented at comparable institutions for ideas on how to present information in the most informative way possible.
- Research ways to collect data on research productivity by our faculty.
- Determine any gaps in our data collection processes in order for us to get a complete picture of the research enterprise at the University
- Produce a final report summarizing the results from the above tasks.

Sponsor: Winifred A. Schumi,
Special Assistant to the Vice President for Research

APPENDIX B: INTERVIEW RESPONDENTS AND BACKGROUND INFORMATION CONSULTANTS

Interview Respondents

LEADERSHIP

Tim Mulcahy	*Vice President for Research*
Frances Lawrenz	*Associate Vice President for Research*
Peggy Sundermeyer	*Director of Collaborative Research Services, Office of the Vice President for Research*

COUNCIL OF RESEARCH ASSOCIATE DEANS

Donna Bliss	*Interim Associate Dean for Research, School of Nursing*
John Bryson	*Associate Dean for Research, Hubert H Humphrey Institute of Public Affairs*
Judy Garrard	*Senior Associate Dean for Research and Academic Affairs, School of Public Health*
Roland Guyotte	*Interim Vice Chancellor of Academic Affairs and Dean, University of Minnesota, Morris*
Jo-Ida Hansen	*Associate Dean for Research and Graduate Programs, College of Liberal Arts*
Steve Hedman	*Associate Vice Chancellor for Academic Administration, University of Minnesota, Duluth*
David Johnson	*Associate Dean for Research, College of Education and Human Development*
Peggy Johnson	*Associate University Librarian*
Mos Kaveh	*Associate Dean for Research and Planning, Institute of Technology*
Brett McDonnell	*Associate Dean for Academic Affairs, Law School*
Charles Moldow	*Vice Dean for Research and Operations, Medical School*
Mark Paller	*Assistant Vice President for Research, Academic Health Center*
Abel Ponce de Leon	*Senior Associate Dean of Research, College of Food, Agricultural, and Natural Resource Sciences*
Joel Rudney	*Interim Associate Dean for Research, School of Dentistry*
Henning Schroeder	*Associate Dean for Research and Graduate Studies, College of Pharmacy*
Mike Schmitt	*Senior Associate Dean, University of Minnesota Extension*
Huber Warner	*Associate Dean for Research, College of Biological Sciences*
Sri Zaheer	*Associate Dean for Faculty and Research, Carlson School of Management*

RESEARCH DEPARTMENT HEADS

Leo Furcht	*Head, Department of Laboratory Medicine and Pathology, Medical School*
Mark Schleiss	*Associate Head for Research, Department of Pediatrics, Medical School*
Charles Schulz	*Head, Department of Psychiatry, Medical School*

RESEARCH COMMITTEES

Dan Dahlberg	*Chair, Senate Research Committee*

HUMANITIES DEPARTMENT HEADS

John Campbell	*Director of Graduate Studies, Department of Psychology, College of Liberal Arts*
Michal Kobialka	*Chair, Department of Theatre Arts and Dance, College of Liberal Arts*
Clarence Morgan	*Chair, Department of Art, College of Liberal Arts*

INTERDISCIPLINARY CENTERS – COLLEGIATE AND SYSTEM WIDE

John Carmody	*Director, Center for Sustainable Building Research, College of Design*
Bob Johns	*Director, Center for Transportation Studies*
Lance Neckar	*Director, Metropolitan Design Center, College of Design*
Steve Ruggles	*Director, Minnesota Population Center*
Robert Vince	*Director, Center for Drug Design, Academic Health Center*
Kyla Wahlstrom	*Director, Center for Applied Research and Educational Improvement, College of Education and Human Development*
Susan Wolf	*Chair, Consortium on Law and Values in Health, Environment and the Life Sciences*

INTERDISCIPLINARY INSTITUTES – COLLEGIATE AND SYSTEM WIDE

Douglas Arnold	*Director, Institute for Mathematics and Its Applications, Institute of Technology*
Claudia Neuhauser	*Biomedical Informatics and Computational Biology Institute and Head, Department of Ecology, Evolution, and Behavior, College of Biological Sciences*
Deborah Swackhamer	*Interim Director, Institute on the Environment*
Ann Waltner	*Director, Institute for Advanced Study*

Background Information Consultants

David Dorman	*Coordinator of Leadership Development, Office of Human Resources*
Adi En Gal Bar Nahum	*Administrative Specialist, Office of Human Resources*
Doug Ernie	*Associate Dean of the Graduate School*
Chris Frazier	*Associate Analyst, Office of Institutional Research*
George Green	*Associate Dean of the Graduate School*
Rich Howard	*Director, Office of Institutional Research and Chair, Metrics Steering Committee*
Ronald Huesman	*Assistant Director, Office of Institutional Research*
Mary Olson	*Analyst, Office of Oversight, Analysis, and Reporting*
Winifred Ann Schumi	*Special Assistant to the Vice President for Research*
Jeanie Taylor	*Assistant Vice Provost for Interdiciplinarity*
Jennifer Windsor	*Chair, FCC Metrics and Measurements Subcommittee*
Karen Zentner Bacig	*Associate to the Vice Provost for Faculty and Academic Affairs*

Design

ByDesign Studio	*College of Design*
Jennifer Rosand	*Training Coordinator, Health Careers Center*

APPENDIX C: PEL RESEARCH METRICS PROJECT – KEY STAKEHOLDER QUESTIONS

1. How do you define research success in your college (unit/institute/center)? Specifically, how is research productivity measured?

2. What data related to measuring research productivity is captured in your college (unit/institute/center) and how is it captured?
   - How is the data used?

3. Do you have research requirements for faculty and research staff? Are there different requirements depending on the faculty or staff rank?

4. What are your future goals for increasing research productivity in your college (unit/institute/ center)?
   - Is there a percentage increase planned? If yes, please specify.
   - What are the specific indicators your college (unit/institute/center) will use to determine if you are accomplishing your research goals?

5. How is interdisciplinary research activity conducted and measured in your college (unit/institute/center)?
   - Is the research conducted across colleges or within one college/unit? Please explain.
   - What challenges, if any, do you face with measuring interdisciplinary research at the U of M?

6. Do you compare your college (unit/institute/center) to similar colleges (units/institutes/centers) at other universities?
   - If yes, which universities and how do you compare yourselves? What metrics are used? Are there any formal or informal processes used?

7. What type of reports or information do you need from OVPR to help you gauge your progress related to measuring research productivity in your college (unit/institute/center)?
   - In what format would you like to receive this information?
   - How often would you like to receive this information?

APPENDIX D:
SELECTED RANKING SYSTEMS AND SURVEYS ANALYSIS - STRENGTHS AND LIMITATIONS

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
The Association of University Technology Managers AUTM Licensing Survey Summary	*Description:* Organization promoting technology transfer between universities and colleges and private enterprise and/or the government. The AUTM Licensing Survey Summary provides data on academic intellectual property licensing activities in the U.S. and Canada. *Metrics* • R & D expenditures received by institutions • Number of patents filed • License agreements • Number of new products introduced to market • Number of executed and start up companies launched • Revenues from license fees, royalties and cash from equity investments paid to the academic institutions • Impact products have on society	• Information disseminated to AUTM membership and the general public. • Provides systematic, objective data about primary activities of academic technology transfer. • Access to data collected through AUTM annual activities is available by subscription to STATT (Statistics Access for Tech Transfer). • The most comprehensive report of technology transfers available in the U.S and Canada.	No method for measuring how responsible patenting and licensing policies are among universities. Although recent national efforts focus on supporting neglected diseases and to collect and make public statistics on university intellectual-property practices related to global health access.
Shanghai Report Academic Rankings of World Universities	*Description* Compiled by Shanghai Jiao Tong University's Institute of Higher Education. Ranks universities by several indicators of academic or research performance. *Metrics* • Alumni winning Nobel Prizes and Fields Medals • Staff winning Nobel Prizes and Fields Medals • Highly-cited researchers in 21 broad subject categories • Articles published in Nature and Science, the Science Citation Index, Social Sciences Citation Index, and Arts and Humanities Citation Index • The size of the institution	• Consistent methodology (except 1st year) • Readily accessible data (available to the public) • Standardized • Worldwide ranking	• Peer reviewed • Top 100 ranked. Only 50 US schools ranked in world top-tier • Scope is biased more toward S&E • Proportion of indicators on teaching and services • Language bias in publications • Selection of awards and the experience of award winners • Technical problems related to the definition of institutions, the attribution of publications and awards, and the history of institutions.

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
Association of American Universities Data Exchange *AAUDE*	*Description* A data repository that members can contribute data to and extract data from. Ranking information based upon user selected comparison group and user selected variables. Universities, funding agencies (like NSF), and other contributors (The Center, ISI, NRC, AAU) submit and extract data from the exchange. Information is aggregated on the institutional level. Data on the individual level is not well developed at present. A finance survey captures information about grants and expenditures as a measure of productivity. Measures of awards are under development.	• Discipline level data available including graduate assistant stipend data, faculty salary and profile data. • Data warehouse is unique for a data exchange. Allows for unique data sources to be linked with more traditional sources (i.e., IPEDS, etc.).	• Difficult to determine level of participants (i.e., uncertain if they are your peers). • May be incomplete since participation is voluntary.
US News & World Report	*Description* Popular ranking on American colleges and universities. Metrics: • Six-year graduation rates and first-year student retention rate • Peer assessment: a survey of the institution's reputation among presidents, provosts, and deans of admission of other institutions. • Student selectivity: standardized test scores of admitted students, proportion of admitted students in upper percentiles of their high-school class, and proportion of applicants accepted. • Faculty resources: average class size, faculty salary, faculty degree level, student-faculty ratio, proportion of full-time faculty • Financial resources: per-student spending • Graduation rate performance: difference between expected/actual graduation rate • Alumni giving rate	• Provides a national view of institutions. • Best-known American college and university ranking. • Popular source of information for prospective students and parents to make informed decisions about which college or university to attend. • Rankings often used for public relations purposes by institutions. • Accountability and performance measures used by administrators, governing boards, and higher education groups.	• Reputation data • Very subjective approach to ranking • Not measured for importance to research institutions • Ranking formula not entirely transparent. • Rankings are unreliable because measures and methodology change from year to year • Data not all available to the public, so peer review of the rankings is limited. • Focuses almost exclusively on input measures — institutional wealth, faculty salaries and acceptance rates — and almost entirely ignores how well a college teaches its students. • Almost every measure favors private institutions over public ones.

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
The Center for Measuring University Performance	*Description* The Center determines the Top American Research Universities by their rank on nine different measures. Includes only those institutions with at least $20 million in federal research expenditures in 2005. *Metrics:* • Total Research • Federal • Research • Endowment Assets • Annual Giving • National Academy Members • Faculty Awards • Doctorates Granted • Postdoctoral Appointees • SAT/ACT range Creates lists of the top 200 public and private universities on each quality measure.	• Consistent methodology that uses the same 9 indicators each year and no weighting of the data • Widely accepted among research universities • Breaks scores out into overall, public, and private institutions • Not a commercial product; nothing "for sale." • Data cannot be manipulated—based on research expenditures reported directly from institutions. • Data crosschecked against federal obligations data reported by federal agencies providing research funding to universities. • Groups universities that perform well on similar number of measures • Does not rank order based on individual institutions like commercial rankings • Adjusts reported figures to ensure data represent strength of a single institution. • Comprehensive data set available on over 600 institutions downloadable for analysis. • Report and web-based data updated annually	• Tiered system • Measures reflect size/ volume of institution • Measures favor institutions with medical centers • Not truly a ranking – no overall score that incorporates all measures
Thompson Scientific Essential Science Indicators	*Description* A resource used by researchers to conduct quantitative analyses of research performance and track trends in science.	• Covers a multidisciplinary selection of 11,000+ Thomson Scientific indexed journals from around the world, this in-depth analytical tool offers data for ranking scientists, institutions, countries, and journals. • Derived from Thomson Scientific's University Science Indicators database; calculates the citations-per-paper (impact) score for each university, based on papers published and cited.	

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
National Science Foundation *Survey of Research and Development Expenditures*	*Description* Provides data of Research and Development Expenditures at Universities and Colleges and collects the separately budgeted R&D expenditures in science and engineering (S&E) fields reported by universities and colleges. *Metrics:* • R&D expenditures by source of funds (federal, state and local, industry, institutional, or other) • R&D expenditures by character of work (basic research vs. applied research and development) • R&D expenditures passed through to sub recipients • R&D expenditures received • Total and federally-funded R&D expenditures by S&E fields • Total and federally-funded R&D expenditures by non-S&E fields • Total and federally-funded R&D equipment expenditures by S&E fields • Federally-funded expenditures by S&E field and federal agency • Academic institution/FFRD • Institutional characteristics • FFRDC characteristics (academic, nonprofit, or industrial)	• Results primarily used to assess trends in R&D expenditures across the fields of science and engineering (S&E). • Most recognized measures of research productivity and standardized research data sets used for research comparisons across institutions. • Assists students and advisers in matching students' career goals with research-doctorate programs. • Informs university administrators, national and state level policymakers, and managers of public and private funding agencies. • Provides large data base for scholars who focus their work on characteristics of the national higher learning educational system and its associated research enterprise.	• Focuses on research in the sciences and engineering to the exclusion of other areas (e.g. arts and humanities). • Official publication of statistics is roughly 2 fiscal years out of data which creates challenges related to connecting internal strategic initiatives with changes in research productivity. • Does not necessarily reflect the overall quality of reputation of an institution or its programs.

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
Faculty Productivity Index *Produced by Academic Analytics*	*Description* Developed by for-profit company that rates faculty members' scholarly output at nearly 7,300 doctoral programs around the country. *Metrics* • Number of books published by faculty • Number of journal articles published by faculty, • Journal citations • Awards and honors • Grant dollars received • Ranking of graduate programs at research university based on objective measurement of per-capita scholarly accomplishment [6] • Student success with mentorship experience • # of students a faculty member has over career • # of students mentored • Awards/honors mentored students have received • Positions mentored students now hold • Areas of services on and off campus (e.g. board members or committee participation)	• Reliable, independent source that measures publication and citation productivity • Objective benchmarks • Transparent methodology • Scheduled to come out regularly and predictably	• Peer reviewed • Faculty identified via Web search • Does not include tenure/tenure track faculty • Faculty lists incomplete or outdated, thereby skewing the ranking system. • Uses the Scopus data base for journals and citations, and books – coverage better for the social sciences. • Unreliable book list based on Amazon.com listings • Focuses solely on faculty scholarly productivity • Initial poor reputation must be overcome • Does not address program's retention rates, length of time students take to obtain a degree, quality of relationships with mentors, what students learn from faculty.

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

Ranking System or Survey[1]	Description/Metrics	Strengths	Potential Limitations/Challenges
National Research Council *of the National Academy of Sciences 2005 Study*	*Description* A project of The National Research Council designed to assess the quality of U.S. research doctorate programs in academic institutions. Provides information on nearly 4,000 doctoral programs in 41 sub disciplines at 274 doctorate-granting institutions. Ranks scholarly reputations of individual programs through subjective ratings by samples of faculty in each discipline. *Metrics* • Counts per faculty member of books and journal articles published, scholarly citations, and national or international academic honors and awards • External research funding for each university as a whole only • Additional metrics captured in the 2008 study: ▪ Demographic variables (gender, nationality, race and ethnicity) of faculty and students ▪ Rates of degree completion ▪ Median time to degree ▪ Proportions and levels of financial support for students (fellowships, traineeships, teaching and research assistantships, tuition and health benefits) ▪ Extent of advising, mentoring and professional development supports.	• Considered the "gold standard" – most reliable measure of quality of PhD programs in institutions. • Widely accepted, quoted, and utilized as an authoritative source of information • Ratings derived from asking faculty involved in doctoral education their views of the scholarly strength of the faculty in peer programs • Methodology clearly stated • Maintains continuity with NRC study carried out ten years earlier • 2008 study more comprehensive • Additional fields of measurement focus on each program's "research impact" and quality of the educational experience for students • Data can be used to compare U of M programs to other universities based on the disciplines. • Data can be used to focus investments in academic areas based on standing, recruitment of doctoral students and faculty and the quality of education • Data can be used to inform programmatic changes in doctoral education.	• Flawed measurement of educational quality. For example, program effectiveness in graduate education derived from a question asked of faculty raters only. • Period of ten years between studies viewed as too long. • Presentation of study data difficult for potential students to access and use. • Use of an outdated or inappropriate taxonomy of fields • Data not sent back to providers for check of accuracy • Not all doctoral programs represented • Some disciplines excluded due to limited numbers of students – several were disqualified • Focus on scholarly quality – reputation and educational quality of the student experience. • Does not provide any information about the academic environment for students (e.g. mentoring, job placement experiences) • Same person surveyed measuring the scholarly and educational quality • Need more objective method to evaluate faculty reputation • State Universities don't seem to get a fair shake. Ivy league schools always seem to come out on top

[1] At the central level, the University of Minnesota currently participates in all of the ranking systems and productivity surveys described in this table.

APPENDIX E: WORKGROUPS INVOLVED WITH DEFINING RESEARCH METRICS

Below are descriptions of the various groups that have been involved in identifying and refining the research metrics the University will use to measure research productivity, a key factor in gauging progress toward becoming one of the top three public research universities in the world within a decade.

Metrics and Measurement Task Force: Appointed by the University's senior vice presidents, the task force was charged to "identify the right metrics and establish a process to best support and analyze the University's progress toward its goal to become one of the top three public research universities in the world within the next decade." .The final report of the task force proposed twenty University-wide performance measures including six measures of research and discovery.

The FCC Metrics and Measurement Subcommittee: Based on the six research and discovery metrics proposed by the Metrics and Measurement Task Force, in 2007, the FCC Subcommittee was charged to identify additional measures that would accurately reflect and measure the relevant aspects of scholarship and creative work conducted by faculty. The final report of the FCC Subcommittee was presented to the Faculty Senate Committee in February 2008. Plans are to solicit feedback from faculty from across the University through an extensive faculty review process. The goal is to make sure that the final list of measures is aligned with the University's goals and values.

The Metrics Steering Committee: The charge of the metrics steering committee is to evaluate the University's progress toward reaching the "top three" ranking as related to its performance on the current 20 metrics identified by the Metrics and Measurement Task Force; to review and evaluate current metrics; to monitor the appropriateness of institutions selected as the U of M's peer and aspiration groups; to monitor appropriate compact level metrics submitted by units; to develop processes and recommend how administrative and academic units can measure productivity gains; to work closely with administrative leaders to identify or modify metrics specific to their area of responsibility; and to recommend how University leadership can use metrics in strategic planning and decision making.

PEL Research Metrics Project Team: The PEL team was charged with reviewing the various metrics collected by the institution and external organizations to determine what additional information related to research activity is needed in order to demonstrate that the U of M is making progress toward achieving our goal of being among the top three public research universities. Through key stakeholder interviews with associate deans of research, interdisciplinary centers, institutes and research committees the project team objectives were as follows:

- Identify or define metrics of research activity required to measure our success toward achieving this goal.
- Determine what research data and information are needed by university leadership, such as college deans, to enable them to have the information they need to strategically address their progress toward achieving this goal.
- Identify compact level measures related to research metrics that the colleges have and what else is needed. Determine if the institution is collecting the right data to be able to provide these metrics.
- Determine how research metric information can be presented in the most effective way.
- Define research metrics that are able to assess the progress and outcomes of specific University- wide initiatives such as interdisciplinary activity.
- Provide feedback from key stakeholders so that OVPR can provide better information to deans and senior leadership to support their decisions relative to strengthening the research enterprise.

APPENDIX F: 2007 UNIVERSITY-LEVEL METRICS

#	Metrics*
Exceptional Students	
1	Student Quality
	A— High school rank (top 10% of entering freshman)
	*B—Average SAT score ** *
	C—Average ACT score
2	Student Diversity (% of entering freshman)
3	Affordability (undergraduate)
4	Student Outcomes**
	A—Undergraduate Retention Rates
	First-year
	B—Undergraduate Timely Graduation
	Four-year
	Five-year
	Six-year
	C—Graduate Time- to- Degree (proposed July 2007)
	D—Degrees Conferred
	Undergraduate
	*Graduate** *
	Professional
5	International Involvement
	A—Study Abroad
	B—International Students
	C—International Scholars
	D—International Faculty (proposed July 2007)
6	Student public engagement activities
7	Student Satisfaction
Exceptional Faculty and Staff	
8	National Academy Members**
9	Faculty Awards in Arts, Humanities, Science, Engineering, Health**
10	Post-doctoral Appointees**
11	Faculty and Staff Diversity
	A—People of Color (% Total HC)
	Faculty
	Staff

#	Metrics*
	B—Gender (male/female)
	Male
	Female
12	Faculty Salary & Compensation
	A—Salary (average)
	Full Professor
	Associate Professor
	Assistant Professor
	B—Compensation (average)
	Full Professor
	Associate Professor
	Assistant Professor
13	Faculty Satisfaction
14	Staff Satisfaction
Exceptional Organization	
15	Financial Strength
	A—Total Financial Resources
	B—Ratio of Unrestricted Resources to Operations
	*C—Total Endowment Assets** *
	*D—Annual Giving** *
16	Facilities Condition
17	Library Quality
Exceptional Innovation	
18	Research Expenditures
	*A—Total ** *
	*B—Federal ** *
19	Citizen Satisfaction
20	Intellectual Property Commercialization
	A—New
	B—Start-ups
	C—Total Active Agreements

* From the May 2006 Metrics and Measurements Task Force Report

** *TheCenter: The Top American Research Universities* (2005)

APPENDIX G: THEME ANALYSIS - ASSOCIATE DEANS AND DEPARTMENT HEADS

How do you define research success in your college/unit?

Common responses:

- When findings represent leading knowledge in the field or expand the breadth of knowledge in the discipline.
- When findings yield higher levels of funding in comparison to others.
- Success is measured by "tangible outputs" (e.g. Publications).
- Amount of funding a project attracts
- Expenditures
- Faculty reputation as measured by scholarly activities (e.g. invitations at conferences and participation in peer review processes).
- In the arts and humanities research success is defined in terms of the "creative process" (e.g. rehearsing, experimenting, and conducting archival research) and must be recognized and cannot be measured using traditional quantitative methods.
- For units that focus on outreach, research success is defined by "level of engagement" (e.g. with external federal agencies and community organizations).

Specifically, how is research productivity measured? What data related to measuring research productivity is captured in your college/unit?

Common responses:

- Publications
- Faculty or staff involvement in journal editing or peer review process.
- Number of grant proposals in process, submitted and pending, proposals that are peer reviewed, and sponsored projects by unit. Grants awarded and the size of each grant award. Award dollars received per faculty FTE
- Faculty invitations to speak at seminars and conferences
- Faculty invitations to participate on grant review panels (e.g. government grant review boards) and to collaborate on research projects and the type and number of collaborations
- Amount and percentage of Indirect Cost Recovery (ICR)
- Number of scholarly recognitions and awards received at local, national and or international levels as well as nominations for awards.
- The amount of sponsored research funds received by each department within a college
- Funding generated based on physical space
- For arts and humanities, invitations to perform at highly recognized venues and invitations to perform or exhibit at local, national, or international venues.

- For arts, music, dance and theatre and humanities research productivity should be examined in terms of the "creative scholarship." - rehearsal, experimentation, and archival research; extensive behind the scenes work that is an integral part of creating a final product and that cannot be measured.

For the non science and engineering fields that cannot be easily measured using traditional quantitative methods, one suggestion was to examine the principles and key components of the mission statement to determine if the principles outlined are integrated throughout the curriculum in a meaningful way (For example: diversity is a key principle – are faculty members integrating and promoting diversity in the way that is consistent with the mission of the department?)

Additional unique quality indicators of research productivity captured by collegiate units:

- Number of faculty leading national initiatives (Lab Medicine)
- Number of diverse faculty (Lab Medicine)
- Juried exhibitions, undergraduate research and degree production at graduation. (Morris)
- Data base or digital development.(Library System)
- Translational research conducted
- Patents and licenses (CLA)
- Contributions to the profession or to the U, especially service to department (Campbell)
- Number of doctoral level students and graduate expenditures
- NRC ranking and essential science indicators. (CFANS)
- Minnesota Agricultural experiment station (MAES) versus sponsored funding, MAES per FTE, sponsored expenditures, core support to sponsored expenditures and return on input. (CFANS)

How is data related to research productivity captured?

A number of electronic data retrieval systems exist across the system. Common responses:

- The Faculty Activities Report (FAR)
- Extension captures data via the budget process and from federal reports.
- Some collegiate units use levels & trends reports produced by OVPR.
- Medical School is developing the H-index, a modified citation index, which measures the correlation between publications in high visibility journals (or having lots of published papers in any journals) and lab space.
- The SPH tracks ICR by certificate approvers
- Humphrey uses electronic annual review of professional activities
- CSOM and Humphrey Institute use AROPA
- Pediatrics uses mission based reports that show how faculty spend their time
- Levels and trends

How is the data related to research productivity used?

Common responses:

- Used primarily for annual performance reviews to make decisions about salary and promotion (tenure track placement) for faculty.
- For summer salary support, endowed chairs (renewal and new)
- Measuring progress at the collegiate level
- Developing institutional goals
- Maintaining a database of experts to enhance connections for collaborative research
- Demonstrating the strength of a unit to external or internal audiences
- Building a reputation so that the unit is more successful in obtaining grants
- Submitting data to national surveys – NRC etc. ASEE, US News and News Report
- Developing annual reports
- For reporting (e.g. for accreditation purposes)
- For capital and building requests and space allocation
- Strategic planning and internal decision-making
- For operational purposes
- Contributing to the college (ICR)

Other unique uses of data

- In Pediatrics, data from the report is also used to allocate space.
- Extension's data is used in reports to grant authorizers.
- In the Humphrey Institute data is used to assess the current climate of the college

Do you have research requirements for faculty and research staff?

Common responses:

- All tenure and tenure track faculty are expected to be "involved in and engaged in scholarship."
- Research requirements are typically reserved for faculty with only a few units indicating research requirements for staff.
- There are measures of quantity (e.g number of publications) and impact (e.g. letters of recognition), serving on review panels, conference presentations, exhibits at national and international venues, etc.)

Other unique research requirements reported by collegiate units:

- In Psychology, faculty spends 50% of their time on research.
- Extension's expectation is that in the field, 20% of one's activity be devoted to research efforts funded through grants and other sources.
- In the Department of Lab Medicine new faculty hires are funded for the first three years, after which they are expected to support their research expenses and 50% of their salary with grants.

- In the AHC, there are different requirements for clinical vs. scholarly track faculty, different requirements for different percentage appointments, and different requirements based on faculty rank.
- In the College of Pharmacy, 20% of a faculty's salary is expected to come from grants.

Are there different requirements depending on the faculty or staff rank?

Common responses:

- Research requirements for faculty and research staff increase in level of responsibility based on rank.
- Research requirements differ for tenured/tenure track faculty, adjunct faculty or affiliates and for P&A staff.
- Requirements are outlined in each unit's 7/12 statement.

What are your future goals for increasing research productivity in your college/unit?

Common responses:

- Collegiate units strongly encourage research productivity
- An increase in publishing and grant activity is desired but specific goals are not formalized.
- In some units, efforts have focused on increasing grant management support to facilitate faculty research activities.

Is there a percentage increase planned related to future research productivity goals?

Specific percentages were not frequently discussed. A number of units shared long range plans a percentage increase in research productivity. For example:

- Institute of Technology set a goal of 5% increase in expenditures over 5 years.
- College of Education and Human Development's goal is to increase research in increments from 0-5 % over 5 years.
- College of Food Agricultural and Natural Resource Sciences anticipates an annual growth rate of 4-5% per year over the next five years.
- A strategic planning goal of the College of Pharmacy is to achieve an estimated $10 million dollars in NIH funding received.
- School of Dentistry aspires to rank in the top 10 nationally for research funding received.
- Extension Service wants to gain recognition as a research unit within the university.
- Department of Pediatrics's goal is to double their research budget over the next five years.
- Medical School's goal is to be ranked among the top 20 medical schools nationally.
- Psychology and Lab Medicine are concentrating on fields that currently have the greatest opportunities for funding. (e.g. cognitive neuroscience and behavioral genetics for Psychology and translational and clinical research for Lab Medicine).

- Newly formed, the Institute on the Environment aspires to achieve funding of 10 million dollars annually when they are running at full capacity.

What are the specific indicators your college/unit will use to determine if you are accomplishing your research goals?

Common responses:

- Number of grants
- Amount of funding received
- Number of papers published
- Number of students/faculty winning national awards.

Unique indicators used to measure research success:

- CEHD uses financial growth indicators – overall sponsored activity, an increasing in ICR resources and land grant commitment – working for the public good, supporting county and state agencies.
- In the humanities research success is measured when students or faculty are invited to perform at highly recognized venues or perform or present products/exhibits/ at local, national, or international venues.
- In the Art department success is when faculty or staff receive one of the most prestigious awards in the field (McArthur, Guggenheim, American Academy of Rome, Bush Foundation, or Preda Rome Prize).
- For Extension Service a critical measure of research success is based on the ability to increase program work through grants through legislative requests (e.g. Agricultural State Board.)

How is interdisciplinary research activity conducted and measured in your college/unit? Is the research conducted across colleges or within each college/unit? Please explain.

Common responses:

- There is no "road map" for conducting interdisciplinary research; each college has their own approach
- No formal system to help faculty learn about others engaged in similar research across the campus.
- Interdisciplinary research most recognizably takes place between colleges, departments, and disciplines at the U of M, and with less reported frequency nationally and internationally.

Several definitions of interdisciplinary research:

- The Medical School defines interdisciplinary research as being "more interdisciplinary than intra disciplinary research."
- CEHD uses the term "Multidisciplinary" to describe the colleges approach to research that is centered on the college's neighborhood or block concept. Neighborhoods bring partners together in a research environment. Blocks have more than one unit involved from across the college or university. An internal indicator is to increase ICR support to higher than 14%.
- Nursing defines interdisciplinary research as that which involves work with other disciplines either across collegiate units, Academic Health Center schools or with external partners such as community based organizations or state agencies, etc.
- A unique approach to promoting interdisciplinary research in the Arts has been the Interdisciplinary Program on Collaborative Arts (IPCA).

What challenges, if any, do you face with measuring interdisciplinary research at the U of M?

Challenges reported are most commonly related to identifying, tracking, crediting, and funding individual efforts. Specifically:

- Tension exists between allegiance to the project and the home department.
- The "silo effect" creates differing standards in each department and in each college.
- Interdisciplinary projects may involve participants with reporting lines to multiple supervisors or vice presidents.
- It is hard to "tease out" contributions of each member.
- Measuring authorship of publications is difficult.
- Sharing ICR is difficult and requires considerable negotiation across departments.
- There is no formal method for tracking interdisciplinary research across the U of M.

Do you compare your college to similar colleges at other universities? If yes, which universities and how do you compare yourselves?

- Benchmarking against other institutions is common practice, but the institutions collegiate units compare themselves to differ widely.
- Colleges generally compare themselves to peer institutions or other Big Ten schools and other recognized institutions or programs in their respective fields.
- Fewer compare themselves to institutions that are identified as our aspiration group or to other U of M departments.

What metrics are used? Are there any formal or informal processes used?

- Benchmarking is often ad hoc, discipline based, and not systematic.
- The most commonly used metric is sponsored research funding.

Specific examples of metrics used to benchmark against similar institutions as reported by collegiate units:

- Academic Health Center schools include level of NIH funding, National Academy memberships, recipients of prestigious awards, data from national associations, and ranking systems.
- Psychology uses qualitative measures related to the "impact" factor such as whether they work on and make progress on important problems, contributions to the field, and what kind of graduation training and opportunities are provided.
- Pediatrics examines the "match range" data for 4th year medical students to compare schools' interest in particular students vs. students' interested in particular schools/programs.
- In CFANS, the Intercollegiate Studies Institute (ISI) uses a formal process to compare different disciplines in our college to those at other national and international institutions; not limited to public universities, but includes private universities, government agencies and international entities. Metrics measured by this query include papers published and citations.
- CSOM uses external review of programs by a panel made up of deans of other schools, participation in (presenting at) major academic conferences, presentations at other schools, and editorial board membership.
- The School of Public Health uses per capita research funding
- School of Nursing uses indicators such as size of the program, program content, number of tenured and tenure track faculty and NIH rankings

What type of reports or information do you need from OVPR to help you gauge your progress related to measuring research productivity in your college?

- Information about currently funded research that is searchable by amount, percent of ICR, faculty member by discipline, names of PI's and co-PI's , and "hit rates" of submissions versus awards.
- Ready access to information about new and follow-on as well as internal and external funding opportunities.
- Comparative information on other parts of the university. For example, Pediatrics wants to know where the Medical School fits in the grand scheme of things. Each of the six schools in the AHC has a home grown system to compile data but there's no way to capture it at the AHC level.
- In addition to raw numbers of grants submitted and awarded, expenditures, etc. units also requested a greater degree of granularity, with information broken down by department, level, and PI. Lab Medicine would like to see mean research dollars per square foot and productivity per capita. They also would like to see more longitudinal data.
- Units would like the OVPR to provide analysis on grants activity including NIH funding trends. Information on how grant money is used, to demonstrate productivity within their units as well as to indicate value to funding agencies.

- Pediatrics wants to be able to get at the "impact factor" – journal citations by faculty member. The department requested information about other institutions, specifically other medical schools, and information on best practices for getting support from administration and various sources—i.e., "how Wisconsin does it."
- The OVPR is also seen as a centralized place for information on interdisciplinary activities, for example the number of papers with shared authorship across U of M schools. For example, CTS would like to be able to do a key word search on a funded project's subject matter. Among other things, this could help generate collaborative ideas. Units would also like to track patterns of collaboration and interdisciplinary research efforts, and who is working with whom.
- SPA data expenditure data is good. Award data is imprecise—numbers, duration, not sure it makes a big difference. SPA data base needs to be more transparent. Med School keeps a shadow data base.
- The percentage of faculty involved in research (e.g. Are 10% of the faculty doing 90% of the load?) IT
- Number of proposals submitted and accepted, number of grants continuing, expenditures.
- Quarterly reports on patents &licensing & intellectual property.
- Compare the college to others by department, center, investigator; what is research vs outreach versus training in the numbers; historical data about where the college is getting and has gotten its money; Info on PI, associate PI, funding source, department, etc.; A better trend line – internal & external; a way to get NOGA info to the Dean's office; NIH funding compared to others (CEHD)
- CLA would like to use OVPR information to further analyze data internally (intent to submit, submissions, awards, progress in the process, and all associated information)
- Need reports showing current grant activity in his college - what is being funded, who is being funded, how much, when did it start, when did it end?
- More accurate methods of tracking Indirect Cost Recovery (ICR) on sponsored activity and division of ICR when it is shared with other colleges.
- Better tracking and crude data on facilities and research space by awarded research dollars would allow for better methods of calculating F&A costs and determining cost per square foot to increase efficiency. Currently, Research and Outreach Centers (ROC) are not tracked well and make analysis tedious.
- Some research expenditures don't show as "research." For example, summer research support is classified as "payroll" but should be "research."
- OVPR can facilitate discussions about best practices for measuring research productivity and best practice ideas for sharing ICR specifically during CRAD meetings.
- Need a process to make it easier to match grant application to awards.
- Need help with citations outside law journals, with publications outside US and citation-count-like measures in associated disciplines.

In what format would you like to receive this information? c) How often would you like to receive this information? Some of the suggestions from collegiate units included:

Only a few representatives from collegiate units responded to this question. Their responses are indicated below:

- Extension would prefer to have the information available so it can be pulled when needed.
- Pediatrics would like an annual report that is printed and bound and delivered with a personal touch, perhaps presented in an open forum with groupings of peers.
- CLA wants on-line, user friendly reports; a combination of prepared reports & canned queries. They would prefer to know when information has been updated and receive the information when it is updated.
- Data presented is not always of the same timeframe.
- Overall, OVPR should collect data systematically and report periodically.

THEME ANALYSIS – INTERDISCIPLINARY CENTERS

How do you define research success in your center? Specifically, how is research productivity measured?

Standard quantitative measures of research success across centers:

- Research funding
- Published research reports
- Peer review articles and proceedings
- Number of websites and tools developed

At the Center for Transportation Studies (CTS), measures of research productivity included:

- Number of faculty and staff with research projects
- Diverse funding sources
- Academic departments involved in research with CTS
- Number of interdisciplinary research teams
- Technical and continuing education funding
- Copies of educational resources distributed
- Participants in technical assistance and continuing education events
- Number of people who attend trainings, conferences, lunches, workshops each year.
- Number of patents and licenses applied for and granted

Qualitative measures of impact that are more challenging to measure included the following:

- Training, education and knowledge transfer
- New technologies that are influenced or developed as a result of the research we coordinate/manage.
- If new standards, procedures and or policies are developed and incorporated into real practice (e.g. MNDOT incorporate CTS research information into daily practices)
- When researchers take back information to their departments and convert that to new applications
- Meeting outreach goals
- Meeting sponsor's needs in terms of deliverables
- Creation of new knowledge as measures of success.

In addition, some center directors mentioned

- Having sufficient grant funding to support the work.
- Being able to share the information with schools and educators
- When staff is fully engaged in the work of investigating important questions
- When staff is fully funded to do the work
- When research meets the needs of sponsors; producing deliverables on time and according to workplan
- Research is measured in grant funding brought in and number of completed projects, number of publications, websites developed, and tools designed for end users
- What data related to measuring research productivity is captured in your center and how is it captured?
- Data capture involves a formal process using a research contract database
- Data is captured using informal reviewing of trends, hits on website.

How is the data used? Data is used for:

- Decision-making by an executive committee
- Informing a national survey in the field
- Internal future planning
- Examining at trends over time
- Monitoring level of funding and trends
- Monitoring outcomes of the research

Do you have research requirements for center faculty or research staff? Are there different requirements defined by the faculty or staff's role in the center?

- There is a diversity of staffing across centers.
- One center, for example, had no research staff at all, only project managers and distractive staff that coordinated projects while the research work came from faculty across the U.
- For other centers, the staff consisted of all researchers that were mostly Professional and Administrative (P&A) with responsibilities based on level of education or experience.

What are your future goals for increasing research productivity in your center? Is there a percentage increase planned? If yes, please specify.

- One center had a specific percentage increase in mind as determined by their college but was skeptical of meeting the goal in the current financial climate.
- Increase in interdisciplinary research with a focus meeting goals based on the mission of the center
- Another center (CTS) would like to increase funding, especially federal funding which is weighted more than state funding, and tackle complex issues that have meaningful outcomes among others.

What are the specific indicators your college/unit will use to determine if you are accomplishing your research goals?

- Maintaining existing paid memberships for centers research
- Make better use of university resources
- Helping other units at the university raise their rankings
- Having more leverage federally in terms of framing future research projects content and funding.

How is interdisciplinary research activity conducted and measured in your centers? Is the research conducted across colleges or within each center?

- Centers work across colleges within the university, across centers, communities and in some cases with other Universities, as well as with other non-university organizations nationally in some cases.

What challenges, if any, do you face with measuring interdisciplinary research at the U of M?

- Having diverse disciplines understand each other
- Measures of success are often defined differently by participants from different disciplines.
- University's definition of interdisciplinary research is still unclear.

Do you compare your center to similar centers at other universities? If yes, which universities and how do you compare yourselves? What metrics are used? Are there any formal or informal processes used?

Responses among centers varied:

- Most comparisons are conducted informally.
- All centers compared themselves to similar centers nationally (or in one case internationally)
- For one center a formal comparison revealed they were number 2 ranking nationally based on research expenditures.

What type of reports or information do you need from OVPR to help you gauge your progress related to measuring research productivity in your center? In what format would you like to receive this information? How often would you like to receive this information?

- Better ways of counting research that is interdisciplinary
- A common, streamlined way of reporting research in general.
- Assistance with sustainability; critical to the next step of focusing on research productivity Base funding is the biggest challenge.
- University-wide retreat to be organized by the OVPR to provide further clarity, definition, and direction related to measuring research productivity.
- Support to do the reporting to allow researchers to be productive.
- Devise a more streamlined way to report.

THEME ANALYSIS – INSTITUTES

How do you define research success in your institute? Specifically how is research productivity measured?

Common indicators used to define success include the following:

- Amount of funding received (presumably because there is no other income)
- the number of grants received
- expenditures
- Number of publications and specifically those published in high impact peer review journals
- Number of members
- New collaborations
- Number of visitors and where they're from
- level of industry buy-in
- Recognition of institute faculty
- Satisfaction of participants who attend the institute
- Presentations at national and international conferences

Examples of indicators of success:

- One indicator of success for the Institute for Mathematics and Applications (IMA) is that institutes from around the world are modeled after IMA.
- The IMA faculty are drawn to the University of Minnesota specifically because of their interest in working at the Institute.
- Serving on national committees is important for having impact long term
- Need to get a sense of what the funding landscape will be in the future.
- Having graduate students that are interdisciplinary gives an opportunity for developing a network among faculty.
- Switching from disciplinary to interdisciplinary research is a huge time commitment, but faculty needs to do it to benefit later

What data related to measuring research productivity is captured in your institute and how is it captured?

- Primary research metrics used to measure our research productivity.
- Systematic peer review system
- Attendance at public lectures and conferences
- Number of publications including book contracts and high impact publications
- Number of seminars conducted
- Number of graduate students trained
- Number of grant applications submitted and grants funded (success rate)
- Number of agencies involved in the project

How is the data used?

- To satisfy a broad base of internal and external key stakeholders.
- Data is also used for the development of annual reports,
- To supply information needed to complete the annual NSF survey,
- For applying for new grants
- To track progress over time
- To evaluate the impact of their work on researcher's careers
- To verify their worth by comparing themselves to similar institutes at other academic institutions.

Do you have research requirements for institute staff? Are there different requirements depending on the staff's role in the institute?

- Faculty are required to research but there are no formal requirements for staff. For example, at the Biomedic Informatic & Computational Biology Institute faculty have temporary membership and membership is based upon the quality of interdisciplinary research & the size of grants. This institute is an incubator institute. Researchers are members of and supported by the institute until such time as they have successfully secured federal funding to become self supporting or have shown lack of ability to progress through the developmental stages related to gaining funding via the grant process (step 1 - seed grants, step 2- applying for funding, step 3 - federal grants, step 4 - center grants)
- The Institute for the Environment administers research fellows only. Fellows are expected to play a leading role in research. They are the "drivers" who coordinate interdisciplinary teams of researchers across the system to do the work of the institute. Administrative staff provide support for the institute but do not have research responsibilities.

What are your future goals for increasing research productivity in your institutes? If yes, please specify. What are the specific indicators your institute will use to determine if you are accomplishing your research goals?

- Institutes did not indicate specific goals related to research productivity.
- Institutes require additional resources to grow related including both personnel and facilities.
- Space is a critical resource issue.
- A primary goal of the Institute on the Environment is to "add capacity" to the U of M's ability to do research as well as to gain research funding for interdsciplinary research in environmental areas.

Is there a percentage increase planned?

- Specific percentage increases related to research productivity were not shared
- Some respondents indicated long term goals. For example, the Institute on the Environment would like to be at "10 million annually" when they are running at full capacity.

How is interdisciplinary research activity conducted and measured in your institute? Is the research conducted across the colleges or within one college? Please explain.

- Definition of interdisciplinary research activity is defined at multiple levels and varies depending on the institute.
- Multi disciplinary defined as being conducted across 2 or more disciplines
- Interdisciplinary combining similar areas of study with faculty who have similar training
- Trans-disciplinary was described as bringing scholars from across many disciplines and divisions together.
- Need to incorporate qualitative methods to interpret the quantitative metrics used to measure research productivity.

What challenges, if any, do you face related to measuring interdisciplinary research at the U of M?

- How do we get passed examining the numbers only (in terms of measuring research productivity)?
- How do we measure the "impact" of interdisciplinary research?
- No significant barriers to conducting collaborative research
- No convenient method for measuring it.
- Breaking across unit silos would help advance collaborative research.

Do you compare your institutes to similar institutes at other universities? If yes, which universities and how do you compare yourselves? What metrics are used? Are there any formal or informal processes used?

- Institutes at the university compare themselves to similar institutes at other large universities nationally
- Comparisons may be formal or informal depending on the institute.
- As a new institute, the Institute for the Environment, unlike many institutions has the opportunity to bring expertise together from across the system. During the planning phase, the institute conducted interviews with a number of well-established institutions across the nation and plan to compare themselves with other institutes selecting measures that are accepted universally as well as metrics that highlight strengths and demonstrate their reputation

- The Institute for Mathematics and Applications (IMA) compares themselves to the Institute of Pure & Applied Math at UCLA (IPAM), the SAMSI at Research Triangle Park, the Mathematical Biosciences Institute at Ohio, American Institute of Mathematics at Palo Alto, the Institute for Advanced Study at Princeton and the Mathematical Sciences Research Institute at Berkeley. Metrics they use for comparison purposes include but are not limited to: amount of funding, web centrality, building & facilities, visitors, events being conducted, who attends, activities participants are involved in, the impact of the website and page rank, effectiveness of post doc program, etc.
- The Institute for Advanced Study, has informal comparison institutions. They often compare themselves to other institutes such as those located at Cambridge, UC Riverside, Rice, U of Chicago. Beyond current quantitative measures used for accountability purposes, they are more interested in integrating other qualitative measures such as how IAS impacts the various fields of study and the role IAS plays in promoting intellectual life of the university.

What type of reports or information do you need from OVPR to help you gauge your progress related to measuring research productivity in your institute? In what format would you like to receive this information? How often would you like to receive this information?

Additional assistance needed related to identifying funding opportunities for research as well as improving the grant management process. Specific recommendations include monitoring the value realized from each grant, identifying grants that are worthwhile to pursue, more effectively tracking the number of people working on a grant, managing the research portfolio to determine how much time is spent working on grants and having someone dedicated specifically to monitoring multi-institutional, federally funded grants.

Improve the accuracy of collegiate level data housed in data warehouse. From the collegiate unit perspective, some respondents indicated that data housed in the data warehouse seems to be "terribly incorrect" and does not "accurately reflect" the activities of the individual collegiate units. Some respondents are "not sure of the source of the data" and are 'unclear about where the data goes" and others noted "repetition of data gathered".

Develop a central database to capture a universal set of quantitative metrics from across the units, centers and institutes. Recommendation is to have OVPR capture common data centrally and then allow individual units to feed in their unique data elements. Overall, recommendation to improve the cyber infrastructure of the U of M as it relates to data management.

APPENDIX H : UNIVERSITY OF MINNESOTA UNIT-LEVEL METRICS CAPTURED

Data Elements	Collegiate Units																		Centers				Institutes				OVPR	Total
	Medicine	Pharmacy	Nursing	Denttistry	CBS	IT	CSOM	Law	Humphrey Inst	CEHD	CFANS	SPH	CLA	Grad School	Morris	Extension	Duluth	AHC	Senate Comm on Research	Center Immunology	CAREI	CTS	Research	Consortium Law & Values	Inst Math & Apps	BICBI	Inst. Adv. Study	Assoc VP - OVPR	
Grants Received	x	x	x	x			x		x	x	x	x	x		x	x	x		x	x	x	x	x	x	x			21
Publications	x	x	x	x	x		x	x	x		x	x			x					x		x	x	x	x	x	x	19
Presentations (or invitations to present)	x	x	x	x			x					x	x		x		x			x			x			x	x	x	12
# Proposals Submitted						x					x		x				x			x				x		x		x	8
ICR	x		x							x	x	x			x						x							x	8
Awards / Honors			x		x	x			x				x	x			x	x											8
Citations						x		x	x		x								x	x								x	7
Federal Grants Received	x	x	x		x	x						x																	6
Peer Reviews (or invitations to peer review)		x	x		x								x									x							5
Expenditures	x										x							x										x	4
# of Graduate Students	x			x									x									x							4
# Graduate Degrees Awarded						x							x									x				x			3
Collaborations			x									x										x							3
Proposal Success Rate						x											x												2
Artistic Presentation (fine arts, dance, music)															x		x												2
H-index (productivity / sq. ft)	x														x					x									2
Conference Participation															x		x												2
Patents Applied for or Granted													x									x							2
Engagement of Undergrads in Research			x												x														2
$ Generated /sq. ft	x																			x									2
Research Space	x																												1
Quality of Graduate Applicants																												x	1
Future Success of Graduate																			x										1
Graduate Expenditures											x																		1
# of Post Docs																												x	1
Download Count								x																					1
Qualitative Data,Linking to the College Mission										x																			1

APPENDIX I : UNIVERSITY OF MINNESOTA USES OF DATA COLLECTED

Uses	Collegiate Units																			Centers				Institutes				OVPR	Total
	Medicine	Pharmacy	Nursing	Denttistry	CBS	IT	CSOM	Law	Humphrey Inst	CEHD	CFANS	SPH	CLA	Grad School	Morris	Extension	Duluth	AHC	Senate Comm on Research	Center Immunology	CAREI	CTS	Intdisc Research	Consortium Law & Values	Inst Math & Apps	BICBI	Inst. Adv. Study	Assoc VP - OVPR	
P&T	x	x	x	x	x	x	x	x	x	x	x	x	x		x		x			x									16
Overall unit productivity			x							x	x						x				x	x		x					7
recognition of faculty / salary	x		x	x			x	x					x				x												7
college decision-making		x			x				x	x	x						x							x					7
data to accrediting body, national associations		x	x	x												x	x					x			x				7
Annual Report		x															x							x	x		x		5
schools already looking to build system to track research		x					x*		x*	x								x											5
faculty assignments	x						x																						2
see how efficiently research funding is alotted																		x											1
Capital & building requests																	x												1
report to OVPR					x																								1
electronically										x																			1
space allocation	x																												1

*AROPA - Annual Review of Professional Activities