# Summary Report of the Intercollegiate Task Force on the Organization of Research & Education in the Life Sciences

September 2007

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on the Organization of Research & Education in the Life Sciences  
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In March 2007, Provost Michael Hogan constituted a Task Force to address the questions of "how we (the faculty of The University of Iowa) can carry out our missions related to these activities (science-related research, education, and service activities campus-wide) with greater efficiency, while also catalyzing new collaborations that may lead to new basic science discoveries, innovations arising from these discoveries that can enhance people's lives, and improved educational opportunities for our students". The committee was charged to ask how the new Institutes and construction of The University Iowa Institute for Biomedical Discovery can be leveraged to achieve such ends. Vice President Jean Robillard was made the chair of the Task Force which consisted of an oversight steering committee comprised of Deans Butler, Keller and Maxson which was to oversee the work of the Task Force. The Task Force consisted of fifteen faculty members representing the Colleges of Medicine, Liberal Arts and Sciences, Engineering, Public Health and Pharmacy (Membership listed in Appendix 1). The fostering of IDR has been a goal of academic, government and industrial entities for the past twenty-five years. The recent publication, Facilitating Interdisciplinary Research from the National Academies Press defines interdisciplinary research as “a mode of research by teams or individuals that integrates information, data, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or field of research practice”.(1)

As pointed out by Johansson in the “Medici Effect”, which is a book dealing with creativity, the “intersection” between disciplines is where the truly landmark achievements are made.(2) Our goal should be to develop an environment which encourages researchers to work to develop these "intersections" and the major scientific advances that they yield. This report will address the charges given to the committee in the context of The University of Iowa Institute for Biomedical Discovery (UIIBD), the University as a whole and the intersection for the University and the UIIBD (Appendix 2).

A. Response to questions related to the UIIBD.

I. What critical areas of the life sciences research should we focus on at the University of Iowa? What are and will be the major themes of sciences of The University of Iowa Institute for Biomedical Discovery?

The criteria for selection of the themes for the Institute was based on the following considerations: 1) relevance to the healthcare needs of the people of Iowa and the world, 2) the expectation of national biomedical research funding support currently and in the future, 3) expertise in the areas already at the University of Iowa and 4) the possibility to greatly enhance that expertise with key recruitments of national leaders in the respective fields. Three themes emerged as the primary foci for research within the Institute, Aging, Neurosciences and Regenerative Medicine. All of these areas overlap with a large number of other biomedical research areas (cancer biology, cardiovascular research, inherited diseases). In the neurosciences, there is a nucleus of excellent workers exploring different aspects of the biology and diseases of the nervous system. The graduate program in neurosciences has been a source of a great deal of interdisciplinary activity between students and faculty from the
Colleges of Liberal Arts and Sciences, Medicine and Engineering. Key programs in this area include the studies on macular degeneration and basic studies of gene therapy approaches for the treatment of neurological diseases. Introduction of new faculty into this area of research will only strengthen an already strong set of programs. The Center on Aging is a major focus of translational research at the University of Iowa. With leadership from the Colleges of Nursing, Medicine and Public Health, this Center has developed excellent research programs devoted to improving the care of our aging populations. The need in this area is for research on basic problems related to the aging process. Currently, the major focus at the University has been on mechanisms involved in telomere modification, a principle factor in the aging process. The ability to expand these basic research programs and to interdigitate them with the translational research on aging is a major goal of this theme. The theme of regenerative medicine will include a broad range of biological, biomedical and engineering approaches to resolve some of the problems of human disease. Considerable work is already ongoing in the fields of hearing loss using cochlear implants, the development of novel prosthetic devices to multiple amputees, understanding the biology of muscular dystrophy, and the use of gene therapy for the treatment of inherited illnesses such as cystic fibrosis. There is stem cell research ongoing at the University of Iowa at the translational (cardiovascular diseases) and the basic level but the previous limitations on such research in Iowa have hampered our ability to recruit national leaders in this field. With the changes in State law, this would be a major focus to faculty development in the Institute.

II. What will be the management structure of the UIIBD?

- Review potential structure for the Institute.

The administration of the UIIBD should follow the matrix model in which people move freely among disciplinary departments that are bridged by interdisciplinary centers, offices and programs. The Director of the Institute should be appointed by and report to the University President. The responsibility of the Director would be to attract world-class interdisciplinary research programs related to the themes of the building to the University of Iowa or to identify existing programs at the University for space within the Institute. The Director would also be responsible for space assignments in the entire building and for decisions about space retention in consultation with the advisory board of the Institute. This individual should have a broad view of science, have previously facilitated interdisciplinary collaborations, previously demonstrated ability to recruit outstanding scientists and an intimate knowledge of biomedical funding processes both from federal and non-profit sources, be or have been a funded investigator in biomedical related research. It would be desirable if this individual had previous experience in fund raising for biomedical research. A clear mandate should be given to the Director to make this an interdisciplinary building involving cross-University units from colleges and departments throughout the life sciences. The advisory board would be chaired by the Dean of the College of Medicine and would be composed of the Deans from CLAS, Engineering, Nursing, Medicine, Pharmacy, Dentistry and Public Health. The committee would meet twice yearly. The role of this committee would be to provide guidance to the Director, to act as a liaison between the Director of the Institute and the President of the University and this committee would serve as the performance review committee for the Director every three years. A scheme of the proposed administrative structure of the Institute is given below.
• **How do we emphasize connection with the campus at large?**

Faculty in the Institute would have faculty appointments within departments and centers in the University. They would participate in service and teaching commitments to these other organizations in a fashion similar to other faculty within the University. In addition, if the goal of scientific excellence is achieved within the Institute, it should serve as a focus for seminars and other educational experiences for faculty on a campus-wide basis.

**B. Response to questions related to IDR on the entire University campus.**

**I. How do we create a university environment that promotes collaboration and interaction?**

There are numerous examples in the Life Sciences of collaboration across departmental and collegiate boundaries in areas of research and training. The Imaging Institute is one example of a very successful collaboration between the Carver College of Medicine and the College of Engineering. Agreements have been worked out about cross-appointments in departments as well as mechanisms for assigning credit on grants which are awarded to co-investigators in different colleges (See Appendix 3). In an analysis of over 1100 funded research projects originating in the Carver College of Medicine, 17% had collaboration with a co-investigator from another college at The University of Iowa (Table 1). Conversely, 51% of the funded projects from the College of Public Health and 39% of the projects from the College of Pharmacy listed co-investigators from the Carver College of Medicine. Data from some of the other colleges also show very strong cross-college collaborations. Twenty-five percent of the
funded projects in the College of Engineering have collaborators in other colleges. With the suggestions provided below, we believe that these interactions can be increased in number and be improved. A survey was conducted in conjunction with the National Academy sponsored Conference on Interdisciplinary Research (See Appendix 4). Attendees at the conference, Provosts from the attendee’s universities and a web survey of over 400 faculty at these universities were questioned about their views on interdisciplinary research. One of the questions which was posed asked about faculty participation in collaborative research. A reasonable number of faculty considered themselves involved in IDR, as 23.7% indicated that they had collaborations with an investigator in another discipline (Appendix 4, page 262).

With that said, the evolution of a culture of interdisciplinary research on our campus will need to be coupled with major changes in the culture of the faculty and administrative organizations within the University. The barriers that exist at other campus (Appendix 4, Figure E-9), exist at Iowa and addressing these barriers goes far beyond the scope to this committee. In particular, it is recommended that a committee be appointed to address the questions related to tenure and post promotion criteria for faculty engaged in IDR with cross-departmental and collegiate appointments.

II. What barriers to cross-college and cross-department collaborations in research and teaching currently exist?

The results of this same survey asked about the barriers to interdisciplinary research at the institutions. Seventy percent of the respondees indicated that there are significant barriers to IDR at their institutions. These barriers included promotion criteria, budgetary control, ICR distribution, space constraints, and strategic plans (see Table 2 and Appendix 4, Figure E-9). All of these same barriers exist at the University of Iowa.

III. How might the barriers be removed?

There must be a major culture and procedural changes to address a number of these issues.

A) Changes may need to be made in promotion criteria. Tenure and promotion criteria were listed as the top impediment to IDR by respondents to the survey in Appendix 4. This is an extremely complex issue that requires a significant change in culture. A critical review of the requirements for tenure may be necessary for IDR to become firmly established. In the National Academy monograph on IDR, the differences between industry and academia promotion criteria are examined. Traditionally, in an academic environment, demonstrated research independence is crucial for promotion whereas teamwork is a major factor in consideration for promotion in an industrial research setting. IDR frequently requires that the individual work as part of a team where their contribution to the research may not be as clearly manifest either in publications or in obtaining extramural grant funds as is necessary under the usual academic promotion criteria. In addition, if IDR is to work, joint departmental recruitments have to occur and promotion guidelines will have to be established for junior faculty recruited by and with appointments in more than one department. It is recommended that a separate committee meet to address these issues in the colleges participating in these IDR programs and that the colleges come to written agreements on these issues. Such agreements may ready exist between the colleges and may be able to serve as a model for the rest of the University.

B) Indirect cost recovery (ICR) redistribution was a major concern to departments and colleges. A Report on the Issue of Interdisciplinary Research and Shared Credit (SC) was
produced for the Vice-President for Research and completed in 2006 (Appendix 5). This document stressed the following four recommendations "(i) it is important that individuals, faculty, staff, deans and DEOs, and units get credit for participating and supporting IDR and ID activities; (ii) IDR and ID activities need to be better tracked so appropriate credit can be assigned to individuals and units; (iii) with respect to external grant awards, individuals and units need to be given appropriate credit and this may be done by giving credit to co-PIs, as well as PIs, and allowing for individuals to associate themselves with multiple units; and (iv) there needs to be appropriate administrative structures and infrastructure in place to support IDR and associated activities". Based on these recommendations the Office of the Vice-President for Research is working with the Division of Sponsored Programs to develop mechanisms for shared credit on grants and expects to have these in place shortly.

C) Strategic plans of departments or colleges can hamper IDR when a faculty recruitment for an individual with a particular set of skills does not move forward because it does not fit with the organizational "strategic plan". Mechanisms (review committees, institutional funding) need to be in place to evaluate the merit of a proposed project on its potential to move fields forward even if it lies outside of the strategic plan of the organization.

C. What cross-campus initiatives are necessary to foster IDR?

I. How will we entice investigators to communicate across their diverse areas of expertise and training, to cooperate in ways that provide true synergy?

A) Barriers can be overcome by offering incentives to faculty who participate in IDR. Many institutions provide intramural funding to initiate such IDR-based projects with amounts varying from very small programs to over $200,000/year with durations of funding up to five years (Appendix 4, tables E-11 and E12). A plan should be developed for a competitive intramural funding program which would fund high quality IDR for a defined period of time (no more than three years) with the expectation of extramural funding at that time.

B) Graduate students co-mentored by faculty members from different departments or colleges can serve as a mechanism to increase IDR. There are potential problems such as different expectations by each mentor which can adversely impact the student. Safeguards to arbitrate these differences need to be discussed and in place before a student enters such a co-mentoring arrangement. Providing stipend and tuition funding from a University source for students co-mentored by faculty from more than one college or department would be an incentive to develop IDR interaction.

C) The development of special fellowships for highly qualified, very promising postdoctoral scientists who engage in IDR would foster interest in this process at an early career stage. Such fellowships could be modeled on the J. Robert Oppenheimer Fellowships at Los Alamos laboratories and last for three to five years. The stipend and benefits would be comparable to the Los Alamos fellowships. These "Presidential" Fellows would work with PI's within the Institute or on the campus at large in other IDR programs, if the fellow(s) show outstanding progress, colleges and departments could work together to develop cross-institutional faculty opportunities for these scientists.
Bibliography:


Other reading of value:

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<th>College</th>
<th>Total Projects</th>
<th>Total UI IDR Collaborations</th>
<th>Medicine</th>
<th>Public Health</th>
<th>Liberal Arts</th>
<th>Nursing</th>
<th>Pharmacy</th>
<th>Dentistry</th>
<th>Engineering</th>
<th>UIHC/Psych Hosp/CDD</th>
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<tr>
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<td>19 (39%)</td>
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<td>Dentistry</td>
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<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Engineering</td>
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<td>15</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>5</td>
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</tr>
<tr>
<td>UIHC/Psych Hosp/CDD</td>
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<td>87 (88%)</td>
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</table>
Table 2
Some Important Campus Barriers to Interdisciplinary Research (IDR)

Promotion criteria – Issues related to independence in an IDR environment, perceived differences in promotion criteria by different departments and colleges.

Budgetary control – All University funds flow through departments hence their buy-in for IDR is crucial for support.

ICR distribution – Credit for funding has to be apportioned to departments and colleges in concert with their involvement.

Space constraints – Space is controlled by the departments and the University. Need to define IDR space.

Strategic plans – Priorities need to fit strategic plan, some IDR programs will suffer if not within the plan.
Appendix 1

Intercollegiate Task Force on the Organization of Research and Education in the Life Sciences

Task Force membership:

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Appendix 2

Provost Hogan’s Charges to the Task Force

I. What critical areas of the life sciences research should we focus on at the University of Iowa? What are and will be the major themes of sciences of the University of Iowa Institute for Biomedical Discovery?

II. How do we create an environment that promotes collaboration and interaction?
   • To what extent are researchers in the life sciences currently collaborating across department and college boundaries on common programs of research and teaching?
   • What barriers to cross-college and cross-department collaborations in research and teaching currently exist?
   • How might the barriers be removed?
   • How will we entice investigators to communicate across their diverse areas of expertise and training, to cooperate in ways that provide true synergy?
   • How do we emphasize connection with the campus at large?
   • How might existing centers (e.g., Cancer Center, Cardiovascular Center) be integrated in these pursuits?

III. What will be the management structure?
   • Review potential structure for the Institute
     a. One single entity with one director setting the agenda?
     b. Overarching multiple centers with a central structure and a director?
     c. A federation of separate centers?
   • What role do department/program boundaries play in determining (or undermining) productive collaborative dynamics related to research and teaching?
Appendix 3

Credit for Collaborative Grant Funding

Proposed Plan from College of Engineering and College of Medicine

Greg Carmichael and Marc Wold

Problem: The issue to be addressed is how to adequately track and report collaborative grants. Tracking would be useful for grants between colleges and between departments in a college. Currently the grant accounting office assigns the collaborative grants by the primary investigator, making it difficult to track or give credit to individuals who are co-investigators and/or contributors to collaborative grants. This situation also makes it difficult to accurately capture all of the grant activity of a unit, yet this information is of great importance when reporting to national surveys.

Goal: Our goal is to develop a mechanism by which collaborative grants can be tracked; ideally without generating significant additional work, creating duplicate data sets, or causing disincentives. The major avenues that were discussed included: ways to utilize the current grant accounting system and/or grant submission process, and implementing additional processes to allow tracking of collaborative grants.

Proposed Pilot Program:

1) In order to examine the practicality of tracking collaborative grants, the College of Engineering will implement an internal, pilot, tracking program. In this program faculty who submit grants will be asked to fill-out an additional routing form with the names and colleges of the other investigators and an estimate of the expected contributions of each. The goal will be to see if self-reported data will be useful.

2) Currently grant accounting has budget information for each funded grant application. We plan to have discussions with grant accounting to identify ways of parsing out contribution information for collaborative grants from this data. Possibilities that were discussed included some type of weighted average based on budget information from the grant. (For example: using personnel costs or total effort expended by different investigators to try to come up with some sort of algorithm that would reflect relative contributions.) It was appreciated that almost any algorithm would only give an estimation of contribution. However, it was felt that without a better understanding of what data is present in the system and how it can be manipulated, we couldn’t fully assess the practicality of this approach.

3) The pilot project will produce summary tables of grant activity for a one-year period parsed in different ways (business as usual, based on self reported data, based on grant accounting data, etc.). The results from this study will provide new information to help us in our discussions of how to assess credit for collaborative research.

4) If the study is “approved”, then the first step will be to have a meeting with sponsored programs, grant accounting, and other interested groups to design the specifics of the study.
Appendix 4

E

Survey of Institutions and Individuals Conducting Interdisciplinary Research

To enhance scholarship and collect quantitative data on the impediments, programs, and evaluation criteria related to interdisciplinary research (IDR), the committee developed survey instruments and disseminated them to provosts and others. In this appendix, we analyze the results of the committee's surveys of those interested in IDR, including students, postdoctoral scholars, faculty, funders, policy makers, and disciplinary societies.

The first survey, referred to in the report as the "convocation survey," was given to the 150 persons who attended the Convocation on Facilitating Interdisciplinary Research, on January 29-30, 2004 (see Appendix C); 91 convocation participants responded to the survey—about a 75 percent return rate. The "individual survey," a slightly modified version of the convocation survey, was posted on the committee's Web site. An invitation to participate in the survey was sent to universities, professional societies, nongovernment organizations, and participants in federal and private interdisciplinary programs; 423 people responded to the solicitation. An invitation to participate in a third survey, the "provost survey," was distributed on line to provosts or vice-chancellors of institutions that conduct IDR; 57 institutions responded.

1http://www7.nationalacademies.org/interdisciplinary/SurveyHome.html. The survey instrument for individuals is appended. It differs from the provost survey in question #1.

APPENDIX E

It must be noted that the survey population does not represent a random sample. There was undoubtedly selection bias in those who attended the Convocation on Facilitating Interdisciplinary Research and in those who responded to the Web-based survey. The results are representative of a wide population of researchers, but cannot be extrapolated to the entire population of researchers involved in interdisciplinary projects and programs. That said, the findings corroborate and extend previous studies of IDR, and offer unique insights on joint appointments and differences between researchers and administrators, and provide suggestions for how to prioritize change efforts.

DISSEMINATION

The convocation survey was distributed at the convocation in Washington, D.C. and the individual survey was distributed by the following organizations. We made every attempt to distribute the survey as widely as possible. Our strategy was to request larger organizations and umbrella societies in a variety of fields to distribute the survey

- American Chemical Society (ACS)
- American Institute of Biological Sciences (AIBS)
- Association for Integrative Studies
- Association of American Medical Colleges (AAMC)
- Association of American Universities (AAU)
- Association of Independent Research Institutes
- Biophysical Society
- Council of Graduate Students (CGS)
- Federation of American Societies for Experimental Biology (FASEB)
- National Association of State Universities and Land-Grant Colleges (NASULGC)
- National Academy of Public Administration
- National Institutes of Health Bioengineering Consortium (NIH BECON)
- DOE National Laboratories
- National Science Foundation (NSF) Engineering Research Centers
- NSF Frontiers in Integrative Biological Research (FIBR) awardees
- NSF Integrative Graduate Education and Research Traineeships (IGERT) awardees
- NSF Science and Technology Centers
- Washington Science Policy Alliance
The following institutions participated in the provost survey. We received the assistance of NASULGC and AAU in distributing the survey to their member universities.

- Barnard College
- Boston University
- Carnegie Mellon University
- Cedars-Sinai Medical Center
- Clarkson University
- Columbia University
- Department of Energy Idaho Operations Office
- Florida State University
- Georgia State University
- Instituto Mexicano del Seguro Social
- Iowa State University
- Jackson Laboratory
- Johns Hopkins University
- Lewis & Clark College
- Massachusetts Institute of Technology
- Medical College of Georgia
- Miami University
- National Cancer Institute
- National Dairy Council
- New York University
- North Dakota State University
- Northwestern University
- Pennsylvania State University
- Purdue University
- Simon Fraser University
- Stanford University
- Syracuse University
- Texas A&M University
- Tulane University
- University at Buffalo
- University of Arizona
- University of California, Irvine
- University of California, Los Angeles
- University of California, Santa Barbara
- University of Chicago
- University of Cincinnati College of Medicine
- University of Houston
- University of Idaho
- University of Illinois, Chicago

SURVEY DEMOGRAPHICS

The committee collected information on respondent position and rank, involvement in IDR, age, and institution type, size, and budget.

Position and Rank

Respondents were predominantly faculty researchers, administrators, or both.

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<th>Position</th>
<th>Convocation</th>
<th>Individual</th>
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<td></td>
<td>n</td>
<td>%</td>
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<tr>
<td>Student</td>
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<td>Total</td>
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<td>100.1</td>
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Respondents to the convocation and provost surveys predominantly held senior positions. The individual survey showed a wider array of ranks, but people holding senior-level positions outnumbered middle-level and junior positions by 2 to 1.
Appendix 4

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Total Surveys (Total) 91 (96) 105.6 423 101.8 57 100.1

*Some respondents gave multiple answers to this question. Percent is calculated using the total number of surveys returned, and may add up to more than 100%.

**FIGURE E-1** Type of institutions responding.

Size, Budget, and Number of Researchers

Survey respondents were asked to indicate the annual budget of their institutions and the numbers of faculty, undergraduates, graduate students, and postdoctoral fellows (see Figure E-2). It appears that most respondents were working at large research institutions. Annual budgets showed a bi-modal distribution, with peaks at $10 million–$100 million and over $1 billion. At the same time, almost half the respondents indicated that they
were not aware of their institutions' annual budget. Responses indicated that institutions tended to have over 500 faculty, 10,000 undergraduates, and over 2,500 graduate students (Figures E-3, E-4, and E-5). Most respondents did not know how many postdoctoral fellows were at their institutions (Figure E-6).

FIGURE E-2 Annual institutional budgets.

FIGURE E-3 Number of faculty and researchers at the respondents' institutions.

FIGURE E-4 Number of undergraduate students at the respondents' institutions.

FIGURE E-5 Number of graduate students at the respondents' institutions.

FIGURE E-6 Number of postdoctoral fellows and trainees at the respondents' institutions.
RELATIONSHIP TO INTERDISCIPLINARY RESEARCH

Participation in Interdisciplinary Research

In the combined surveys, 94 percent of respondents were at least partially involved in IDR.

<table>
<thead>
<tr>
<th>Participation</th>
<th>Convocation</th>
<th>Individual</th>
<th>Provost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Primarily interdisciplinary</td>
<td>53</td>
<td>58.2</td>
<td>263</td>
</tr>
<tr>
<td>Partially interdisciplinary</td>
<td>28</td>
<td>30.8</td>
<td>147</td>
</tr>
<tr>
<td>Not interdisciplinary</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Not answered</td>
<td>10</td>
<td>11.0</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>100.0</td>
<td>433</td>
<td>102.4</td>
</tr>
</tbody>
</table>

Specific Roles

Respondents were asked to indicate how they were involved in IDR. This was a free-answer section; responses were analyzed and categorized by staff. Because more than one answer could have been provided, results may add up to more than 100 percent.

<table>
<thead>
<tr>
<th>Involvement in IDR</th>
<th>Convocation</th>
<th>Individual</th>
<th>Provost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>Oversee or support IDR programs</td>
<td>19</td>
<td>23.5</td>
<td>0</td>
</tr>
<tr>
<td>Fund IDR programs or grants</td>
<td>14</td>
<td>17.3</td>
<td>0</td>
</tr>
<tr>
<td>Research is interdisciplinary</td>
<td>41</td>
<td>50.6</td>
<td>366</td>
</tr>
<tr>
<td>Collaborate with others in different disciplines</td>
<td>3</td>
<td>3.7</td>
<td>97</td>
</tr>
<tr>
<td>Head/director of IDR program</td>
<td>7</td>
<td>8.6</td>
<td>28</td>
</tr>
<tr>
<td>Involved with IDR training program</td>
<td>7</td>
<td>8.6</td>
<td>28</td>
</tr>
<tr>
<td>or teach IDR classes</td>
<td>2</td>
<td>2.5</td>
<td>18</td>
</tr>
<tr>
<td>Editor of IDR journal</td>
<td>0</td>
<td>0.0</td>
<td>2</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>9.9</td>
<td>8</td>
</tr>
<tr>
<td>Total involved in IDR</td>
<td>81</td>
<td>410</td>
<td>46</td>
</tr>
<tr>
<td>Not interdisciplinary or not answered</td>
<td>10</td>
<td>13</td>
<td>11</td>
</tr>
</tbody>
</table>

Ranking of Institutional Environment for IDR

Respondents were asked to rank the general supportiveness for IDR at their current institution and up to two previous institutions on a scale of 0 (IDR-hostile) to 10 (IDR-supportive). There appears to be a trend toward more supportive environments for IDR. It is possible that respondents moved to institutions that were more supportive during the course of their careers. Rankings are reported as mean +/- standard deviation. Not all respondents provided an answer. The total number of responses to this question was n = 480.

<table>
<thead>
<tr>
<th>Environment for IDR</th>
<th>Convocation</th>
<th>Individual</th>
<th>Provost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current institution</td>
<td>7.74 +/- 2.07</td>
<td>7.25 +/- 2.31</td>
<td>7.24 +/- 1.70</td>
</tr>
<tr>
<td>Previous institutions</td>
<td>5.95 +/- 2.17</td>
<td>6.35 +/- 2.57</td>
<td>5.67 +/- 2.04</td>
</tr>
</tbody>
</table>

To determine whether rank was associated with institution size or budget, we sorted the rankings by annual budget, number of faculty, and number of undergraduates (see Figures E-7 and E-8). There was no relationship between number of undergraduates and ranking, but there are some interesting trends for budget and number of faculty. It appears that smaller or larger institutions have a better environment for IDR than those with intermediate budget and faculty numbers.

![Figure E-7: Relationship between institutional budget and rank.](image-url)
INTERDISCIPLINARY RESEARCH AT INSTITUTIONS

When asked whether there were impediments to IDR at their current institutions, 70.7 percent of the respondents answered yes, 23.2 percent answered no, and 6.2 percent did not know or did not answer (see Figure E-9).

![Figure E-9](image-url)  
**Figure E-9** Top impediments to interdisciplinary research at various institutions.

Respondents were provided a list and asked to rank the top five impediments to IDR at their institutions (see Figure 4-5). The list included budget control, indirect-cost recovery (ICR), publication in disciplinary and interdisciplinary journals, compatibility with college or department strategic plans, promotion and tenure criteria, credit for joint authorship, unit reporting relationships, space allocation, honoring award agreements, restrictions on faculty autonomy, and other. The chart indicates the percentage of respondents who gave an impediment top ranking. It is interesting to note that “individuals” and provosts ranked impediments differently. Furthermore, impediments often mentioned in research literature—authorship credit and publication—were among the lowest ranked by both respondent groups. The impediments that were most often ranked first by “individuals” were promotion criteria, budget control, ICR, and compatibility with strategic plans. For provosts, the top impediments were promotion criteria, space allocation, budget, and ICR.

Seed Money

Respondents were asked whether their institution provided seed money to help start up interdisciplinary programs and were asked to briefly describe the amounts available and the major criteria used in making awards. Over half the institutions provided such “venture capital” for interdisciplinary work. Amounts provided ranged from $1,000 to $1 million. Duration of awards also varied but tended to be short: 1- to 2-year grants (see Figures E-10, E-11, and E-12).

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Three main criteria were cited by survey respondents for evaluating proposals for seed money:

1. What is the likelihood that this project or program, once developed, would generate outside funding? (21 percent)
2. What is the scientific merit of the work? (20 percent)
3. Is the work truly interdisciplinary? (20 percent)

“Other” responses (19.8 percent) ranged from selection-committee biases to university or department long-term strategic goals. Respondents often cited more than one criterion for determining seed-money allocation; therefore, the percentage of responses (based on the number of respondents) exceeds 100 percent (see Figure E-13).
### Interdisciplinary Programs and Characteristics

Respondents were asked to list and describe up to three interdisciplinary programs at their institutions with which they were currently involved, including centers and teaching programs. They were asked to indicate the number and name of each involved department, whether extra-institutional groups were involved, the number of researchers, whether there were associated faculty lines or training slots, the sources of funding, whether there was a central facility for the program, and how space was allocated. Over 800 programs were described, and this yielded rich data for anyone interested in examining the current organizational structure of IDR programs and centers. Among the findings, respondents indicated that 29.5 percent of the centers and programs did have faculty lines, whereas 33.3 percent did not; 12.3 percent stated that faculty lines did not apply to the program listed, and 24.7 did not know or did not provide an answer. The percentage of associated training slots was higher: 40.9 percent of programs listed had such slots, 23.1 percent did not.

### EVALUATION OF INTERDISCIPLINARY RESEARCH PROGRAMS

Respondents were asked to describe dominant forms of evaluation used by their institutions to evaluate interdisciplinary programs. The predominant methods of evaluation were internal and external visiting committees and informal feedback. Percentages add up to more than 100 because respondents could choose more than one answer.
PROPOSED RECOMMENDATIONS

Finally, respondents were asked to list one action that each stakeholder group could take to best facilitate IDR. Responses were categorized and are illustrated below in graphs for institutions, units and departments, funders, journal editors, principal investigators and team leaders, educators, postdoctoral scholars, and students. These were free-response questions; staff analyzed and categorized the responses. Percentages are based on the numbers of responses provided for each category.

The top three recommendations for institutions (n = 341) were to foster a collaborative environment (26.5 percent), to provide faculty incentives (including hiring and tenure policies) that reflect and reward involvement in IDR (18.4 percent), and to provide seed money for IDR projects (11.1 percent). See Figure E-14.

The top three recommendations for departments (n = 294) were to adopt new organizational approaches to IDR (32.1 percent), to recognize and reward faculty and other researchers for interdisciplinary work (20.8 percent), and to adapt or increase departmental resources to support IDR (12.3 percent). See Figure E-15.

The top three recommendations for funding agencies (n = 266) were to provide more support for IDR (39.1 percent), to develop and implement a more effective review process for IDR proposals (17.7 percent), and to rethink funding allocation strategies (11.3 percent). See Figure E-16.

The top two recommendations for journal editors (n = 196) were to adjust the expertise of editorial and review panels and incorporate more reviewers with IDR experience (38.8 percent) and to feature novel innovations and initiatives (36.2 percent); 17.3 percent of respondents reported that they were satisfied with the current situation. See Figure E-17.

The top three recommendations for principal investigators (n = 186) were to increase leadership and team-forming activities (44.1 percent), to develop and clearly state their research goals and their overall vision (34.4 percent), and to build networks with researchers in other disciplines (20.4 percent). See Figure E-18.

Respondents (n = 190) recommended that educators develop curricula that incorporate interdisciplinary concepts (64.7 percent), take part in teacher-development courses on interdisciplinary topics (40 percent), and provide student opportunities in IDR (23.7 percent). See Figure E-19.

Respondents (n = 157) encouraged postdoctoral scholars to get a broad background and learn new skills (14.0 percent), to find a postdoctoral fellowship in a field different from their own graduate work (12.7 percent), and to develop collaborations and seek additional mentors (12.1 percent). See Figure E-20.
Finally, respondents (n = 171) recommended that students cross boundaries between disciplines (25.1 percent), take a broad range of courses (23.4 percent), but also develop a solid background in one discipline (12.3 percent). See Figure E-21.
Appendix 4

FIGURE E-17 Recommendations for journal editors.

FIGURE E-18 Recommendations for principal investigators.

FIGURE E-19 Recommendations for educators.

FIGURE E-20 Recommendations for postdoctoral scholars.

FIGURE E-21 Recommendations for students.
THE "INDIVIDUAL" IDR SURVEY

Demographics

1. Please tell us about yourself:
   _ Researcher/faculty member
   _ Administrator
   _ Student
   _ Postdoc

Rank:
   _ Senior
   _ Mid-level
   _ Junior

Age: _____

Describe your research:
   _ Primarily interdisciplinary
   _ Partially interdisciplinary
   _ Not interdisciplinary

2. Which of these best describes your institution?
   a. _ Public Academic
   b. _ Private Academic
   c. _ Industrial R&D organization
   d. _ Government R&D organization
   e. _ Independent research institute
   f. _ Other (Please describe): ____________________________

3. What is the size of your institution?
   a. Annual budget:
      _ $0-1 Million
      _ $100-250 M
      _ $750 M-1 Billion
      _ $1-10 M
      _ $250-500 M
      _ $750 M-1 Billion
      _ $10-100 M
      _ $500-750 M
      _ Do Not Know

   b. If research institution, number of:
      Faculty/Researchers
      Undergraduates
      Graduate Students
      Postdoctoral Researchers, Fellows, and Trainees

Relationship to Interdisciplinary Research

4. How are you involved with interdisciplinary research?

5. Based on your personal experiences, rate your present institution and prior institutions (that you feel able to judge) on general supportiveness of interdisciplinary research (IDR) using a scale from 0 (IDR-hostile) to 10 (IDR-friendly):

   Current institution name:
   rating: 0 1 2 3 4 5 6 7 8 9 10
   (hostile) (very supportive)

   Previous institution name:
   rating: 0 1 2 3 4 5 6 7 8 9 10
   (hostile) (very supportive)

   Previous institution name:
   rating: 0 1 2 3 4 5 6 7 8 9 10
   (hostile) (very supportive)

Interdisciplinary Research at Your Institution

6. Are there impediments to interdisciplinary research at your institution?
   Yes _____ No _____ Do Not Know _____
   If yes, please indicate the top 5 impediments in order of importance.
   _ Budget control
   _ Indirect cost recovery distribution
   _ Publication in disciplinary/interdisciplinary journals
   _ Compatibility with college/dept strategic plans
   _ Promotion and tenure criteria
   _ Credit for joint authorship
   _ Unit reporting relationships
   _ Space
   _ Honoring award agreements
   _ Restrictions on faculty autonomy
   _ Other ____________________________

7. Does your institution provide seed money to help start up interdisciplinary programs? If yes, please briefly describe the amounts available and major criteria employed in making awards.
   Yes _____ No _____ Do Not Know _____
If yes, please indicate:
Amount:
Duration:
Award Criteria:

8. Does your institution make joint appointments for interdisciplinary faculty/staff members in which salary support is shared between departments, units, and/or schools?
   Yes ______ No ______ Do Not Know ______
   If yes, what proportion of the faculty/staff have such joint appointments?
   __0-10%  __10-25%  __Over 25%

9. Using the table below, please list and describe up to three interdisciplinary program(s) at your institution with which you are currently involved. These programs could be centers, organized research units (ORUs), teaching programs, etc.

<table>
<thead>
<tr>
<th>Program/Center:</th>
<th>Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>URL:</td>
<td></td>
</tr>
<tr>
<td>Contact person:</td>
<td></td>
</tr>
<tr>
<td>Phone #/e-mail:</td>
<td></td>
</tr>
</tbody>
</table>

i. Number of involved depts/schools/colleges
   __1  __Don't know  __1  __Don't know  __1  __Don't know
   __2-4  __2-4  __2-4
   __5-10  __5-10  __5-10
   __Over 10  __Over 10  __Over 10

ii. List the primary depts. involved:

iii. Extra-institutional groups involved?
   __Yes  __Yes  __Yes
   __No  __No  __No
   __Don't know  __Don't know  __Don't know

iv. Number of Researchers
   __1-5  __1-5  __1-5
   __5-10  __5-10  __5-10
   __10-20  __10-20  __10-20
   __Over 20  __Over 20  __Over 20
   __Don't know  __Don't know  __Don't know

Evaluation of Interdisciplinary Research Programs

10. What are the dominant methods of evaluation employed by your institution to evaluate interdisciplinary programs? (check all that apply)
   — Visiting Committee
   — Internal Committee
   — Benchmarking Surveys
   — Interviews
   — Informal Feedback
   — Principal Investigator Assessment
   — Do not know
   — Other (Please describe):
11. What are the dominant methods you use to evaluate the success of interdisciplinary programs? (select up to three or add your own).
   ___ Level of (or potential for) scientific discovery or innovation
   ___ Quality of leadership
   ___ Attracting a greater number/mix/caliber of undergraduates into science
   ___ Enhancing the richness of the undergraduate/graduate experience
   ___ Increasing the ability to attract outstanding faculty/postdocs
   ___ Societal relevance of problem being addressed
   ___ Enhancing institution’s reputation
   ___ Increasing institution’s research funding levels
   ___ Do not know
   ___ Other (Please describe):

Proposed Recommendations

12. If you could recommend one action each of the following could take that would best facilitate interdisciplinary research, what action would that be?
   a) Institutions:
   b) Units/Departments:
   c) Funding Agencies:
   d) Journal Editors:
   e) Principal Investigators/Team Leaders:
   f) Educators:
   g) Postdocs:
   h) Students:
A Report on the Issue of Interdisciplinary Research and Shared Credit (IDR and SC)

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Executive Summary

Interdisciplinary Research (IDR). The need for and the importance of interdisciplinary teaching and research have been clearly articulated in the 2004 National Academies report “Facilitating Interdisciplinary Research” (1). The report identifies four drivers of interdisciplinary research. They are:

1. The inherent complexity of nature and society;
2. The drive to explore basic research problems at the interface of disciplines;
3. The need to solve societal problems;
4. The stimulus of generative technologies.

The report gives an in-depth review of the need for and some of the barriers to interdisciplinary teaching and research. The Task Force (TF) looked carefully at the 2004 report as it prepared this report which is specific to The University of Iowa.

Interdisciplinary Research and The University of Iowa. A goal of the University of Iowa is to create an environment in which individuals and units involved in interdisciplinary research can thrive so that important societal problems can be solved in the most creative and best ways. As stated in the University’s recent strategic plan, The Iowa Promise: A Strategic Plan for The University of Iowa 2005-2010, the University is committed to improving the infrastructure and culture central to the growth of research, scholarship, and creative work, including interdisciplinary and international efforts and adopting administrative structures and incentives that encourage strategic cross-unit collaborations.

Charge to the Committee. The committee has been charged by Vice President of Research Meredith Hay and Graduate College Dean John Keller to: (i) identify the current barriers to interdisciplinary research; (ii) define and articulate the full range of issues covered by shared credit; (iii) define and articulate how different colleges and departments may or may not be affected by the issue of shared credit; (iv) determine if there are models within the university that are working and can be duplicated in other units; (v) determine what [if any] processes/procedures within both pre- and post-award management offices might facilitate the distribution of shared credit as grants/contracts are submitted or expended (vi) determine if our peer universities have approached the issue of shared credit and if any of these solutions can be applied at UI; and (vii) develop a set of guidelines, to be presented to the Dean of the Graduate College and the OVPR, that will help The University of Iowa establish best practices for shared credit involved in interdisciplinary research.

Findings and Recommendations. Interdisciplinary research provides exciting opportunities for faculty and staff. Shared credit is an important component to supporting interdisciplinary research and interdisciplinary activities. Several findings and recommendations are given to facilitate the process of assigning appropriate credit for interdisciplinary research and associated activities and for enhancing IDR on campus. These include: (i) it is important that individuals, faculty, staff, deans and DEOs, and units get credit for participating and supporting IDR and ID activities; (ii) IDR and ID activities need to be better tracked so appropriate credit can be assigned to individuals and units; (iii) with respect to external grant awards, individuals and units need to be given appropriate credit and this may be done by giving credit to co-PIs, as well as PIs, and allowing for individuals to associate themselves with multiple units; and (iv) there needs to be appropriate administrative structures and infrastructure in place to support IDR and associated activities.
Introduction

Interdisciplinary research is defined as a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice (1). The 2004 National Academies report “Facilitating Interdisciplinary Research” discusses the *accumulation of disadvantages* that can occur when individuals participate in IDR and barriers that need to be overcome.

The focus of the current report is on the issue of interdisciplinary research (IDR) and shared credit (SC). In this report the current barriers to interdisciplinary research are examined. The issue of shared credit, a potential institutional barrier to interdisciplinary research, is addressed.

The report is organized according to the specific requested action items charged to the committee. As noted in the Executive Summary, the Interdisciplinary Task Force for Shared Credit was charged to:

1. Identify the current barriers to interdisciplinary research;
2. Define and articulate the full range of issues covered by shared credit;
3. Define and articulate how different colleges and departments may or may not be affected by the issue of shared credit;
4. Determine if there are models within the university that are working and can be duplicated in other units;
5. Determine what [if any] processes/procedures within both pre- and post-award management offices might facilitate the distribution of shared credit as grants/contracts are submitted or expended?
6. Determine if our peer universities approached the issue of shared credit and if any of these solutions can be applied at UI;
7. Develop a set of guidelines, to be presented to the Dean of the Graduate College and the OVPR that will help The University of Iowa establish best practices for shared credit involved in interdisciplinary research.

The last action item, #7, is most significant as it provides guidance for making The University of Iowa a place where interdisciplinary research thrives so that important societal problems can be solved in the most creative ways, and individuals and units involved in interdisciplinary research can reach their full potential for excellence. For this reason, requested action item is given its own section.
Action Items 1–6

The committee met to discuss the requested action items three times during the Fall ’05 semester. The main points of this discussion are summarized below.

1. Current barriers to interdisciplinary research.
   - The 2004 NAS report notes that IDR and ID activities, which extends to ID teaching and ID service, often require greater effort (for a variety of reasons including logistics and geography) and these activities are sometimes given less credit. In many cases, the major barrier to faculty ID teaching is lack of faculty time and the expectation that it will be done as an overload teaching assignment. Often ID teaching and research take longer to learn and do, which can affect credentials for promotion. It is important that appropriate credit be given for collaborative ID research, teaching and service.
   - In some cases, there is an apparent lack of support from deans and DEOs for ID activities. Several reasons were discussed for this including a lack of resources, but also deans/DEOs are rewarded for building their discipline and there is little reward for them to be generous with their time or the time of their faculty. This is identified as an institutional/administrative barrier.
   - Infrastructural barrier to ID activities; e.g. who provides staff support? Therefore, a large barrier is related to lack of a unit to administer IDR. The lack of support is deemed as a significant barrier to expansion in ID activities.
   - It should be noted that extra-departmental University support is crucial. Interdisciplinary research centers/institutes can be instrumental in facilitating IDR by providing forums (presentations, journal clubs) for colleagues to interact, space, staff support and sometimes seed funds.
   - In some cases, it is the faculty who are reluctant to embrace IDR or are unsupportive of their colleagues involved in IDR.
   - Those involved in interdisciplinary activities often would like to have joint appointments in different departments or colleges (including secondary appointments which are defined as 0% joint appointments). However, it was noted that there could be disadvantages to having joint appointments. For example, there may be differences in promotion and tenure expectations between departments.

2. Range of issues covered by shared credit
   - For the individual faculty or research staff member, proper credit for IDR and ID activities is essential to deliberations on promotion, tenure and merit salary raises. With respect to authorship, we note that the University is working on an authorship policy to policy to ensure credit is appropriately attributed to all contributing authors. However, some universities are more proactive in educating faculty, staff and students concerning authorship issues, e.g. Stanford University (2).
   - For units, it is equally essential to accurately credit IDR activities performed by their members (e.g. grant activity). This is especially important for reporting to national surveys, as it will impact unit rankings.
   - When assigning credit, questions arise, e.g. how to give credit for joint publications and how to assess journal quality when an article is published in an interdisciplinary journal?
Interdisciplinary research is often published in journals that are outside the boundaries of a single discipline. It is therefore important that in all reviews (for faculty and research staff) information as to the quality and impact of the venue be accurately conveyed.

- Other questions include: how to give credit for activity in IDR such as graduate student training, or service on dissertation committees? how should faculty report to home department concerning their involvement? how to assign space for IDR activities? IDR activities with graduate students from different departments doing research within a single department can occur; however, there is no space for the outside graduate students. IDR has created and will continue to create challenges for space planning as research broadens and interconnects across unit boundaries continue to expand.

- In some discussions on campus it has been proposed that interdisciplinary groups be housed at Oakdale, but this was seen as being too isolated. Lack of proximity is often a barrier to ID activities. Thus it is crucial that interdisciplinary investigators be centrally located and not pushed to periphery of campus. To be recognized as centrally important, they must be centrally located.

- With shared credit comes shared responsibility; thus how should legal issues be addressed, or how should issues concerning overspending be addressed? Setting up sub-accounts is an existing mechanism that can be used to provide information to co-investigators and budget accountability for different portions of a project. However, new questions arise including the question of who is responsible for compliance and who is ultimately liable for violations and regulations.

- ID research often has direct applicability, and as a result the issues on intellectual property (IP), control of data, and the right to commercialize become important. The University of Iowa Research Foundation can help researchers through these issues.

- Financial planning and management considerations are also quite important. These considerations include grant proposal submission, post-award accounting and post-award credit to PIs, co-PIs, departments and colleges.

3. Differences of the effects of the issue of shared credit in the different colleges and departments

- In general, faculty as well as departments and colleges with faculty involved in IDR grants do not get much credit when they are co-PIs compared to the PI. This may impact some colleges more than others. For example, those doing health-related interdisciplinary research in a college that is not a traditional health science college (e.g. CLAS or CoE) may submit proposals through a health college (e.g. COM) as this may be advantageous when applying for external funding to agencies such as NIH. In addition, differences in staff support for proposal preparation may dictate which unit a proposal is submitted through. This may impact some colleges more than others.

- Credit for teaching differs from mission to mission – i.e., grad student, fellow, resident. ID teaching has different effects but also opportunities. Receiving credit comes down to effort reporting. It is important to consider credit for teaching in addition to scholarship.

- The Graduate College does not currently receive credit for institutional partnering on a grant, and therefore does not share in any indirect cost returns. Thus, the Graduate College has no way to build back resources from partnering departments.

- No credit is given to centers supported by colleges when patents are received. This may impact some colleges more than others.
It was noted that spending is not always directly connected with magnitude of contribution. For example, if buying a big piece of equipment for the research, which unit gets credit? This may impact some colleges more than others.

4. Current models of shared credit used within the university that can be transferred to other units

- Several colleges have developed systems for discriminating levels of contribution to publications. These publication models are self-reporting notation.  
  - CLAS has a self-reporting star system to indicate involvement in publication as a way to give credit  
  - Several colleges (including Medicine, Nursing, Pharmacy and others) look at the total picture, allowing faculty to make a notation on the publication concerning their involvement  
- College of Medicine routinely sets up sub-accounts to deal with shared credit for funding. However, there is no formalized mechanism for shared credit in teaching, this is dealt with at the departmental level.
- College of Nursing splits the PI/Departmental portion of the F&A returns between the co-PIs home departments.
- It was also noted that the Obermann Center is a potentially good working model for interdisciplinary interactions as it provides important components that facilitate IDR activities including space, seed grant funding, and common areas and that the Graduate College Interdisciplinary Studies MA and PhD degree programs are good models for graduate teaching and training.

5. Processes and procedures within pre- and post-award management offices that might facilitate the distribution of shared credit as grants and contracts are submitted and expended

- Sponsored Programs and Grant Accounting provide for multiple investigators on pre-award side and allows for sub-accounts on the post-award side. It is anticipated that data will be easier to access since People Soft General Ledger was activated in January 2006. It is also anticipated that the University will have more flexibility to add fields that will allow additional tracking of data. This should help in crediting colleges and units participating in IDR.
- It should be noted that with our previous pre-award system, it is possible to access multiple principal investigator and cross unit activity. By accessing these data, it was determined that 16% percent of our projects, and 35% of our award funding, include cross unit collaboration. In addition, the average award size for those projects that have cross unit collaboration is about $431,000 compared to the average award size for the remaining projects of $150,000.
- College of Engineering and College of Medicine have discussed but have yet to pilot a pre-award credit system for percent effort (described in Appendix A). This would be a way to assign credit as it was noted that expenditures and effort could be very different.
6. Approaches used on the issue of shared credit by peer institutions and their transferability to the University of Iowa

- It appears that other institutions are also dealing with the issue of interdisciplinary research and shared credit (excerpts are provided in Appendix B). Potential models from other institutions were explored: Penn State has a document on assigning shared credit for multi/interdisciplinary grants (3); UC Irvine has prepared a report on overcoming barriers for multidisciplinary research (4); and Emory University also has a document which discusses shared credit. The Penn State document asks PIs for additional tracking information for grants submitted. This model may be transferable to the University of Iowa.

- It should also be noted that many journals have guidelines for shared credit authorship. For example, the International Committee of Medical Journal Editors (formerly the Vancouver Group) established the uniform requirements for manuscripts submitted to biomedical journals, which has been formally adopted by over 600 international journals (6). These guidelines may be useful for researchers at the University of Iowa.

Action Item 7–Recommendations and Guidelines

As discussed in the Executive Summary and Introduction, there are many important reasons for institutional support of IDR and related activities. Below are recommendations for facilitating IDR and ID activities with a focus on the issue of shared credit.

- Provide support and incentives for Deans/DEOs to participate and support their faculty involved in IDR and ID activities.
- There needs to be a better system for reporting the full range of IDR and ID activities so that individuals, faculty, staff, deans and DEOs, and units can get the credit they deserve for these activities and be rewarded for these activities. Deans should be involved in designing and implementing such a system.
- It is important for external grant proposal and proposal submissions that the internal routing form and internal accounting be changed to allow for both multiple PIs and for multiple units per PI and for the relative contributions of each PI.
- In the current fiscal environment, less money is available for IDR activities. Designate funds to support new initiatives perhaps from F&A recovery. A tangible investment is needed to encourage relationships that have yet to form.
- The current IDR accounting makes it difficult to track and allocate such funds. At the pre-award stage, adjust the routing form to track whether an application/proposal is for IDR (e.g. a box on the routing form).
- Explore the feasibility of building and designating IDR space on both sides of the river.
- Provide additional administrative and staff support for IDR activities. This may be done through research centers as these centers support IDR.
- Establish an advisory committee of faculty successful in IDR to evaluate new centers and to evaluate proposals to provide seed money for IDR.
- Explore providing credit to interdisciplinary teaching through the course numbering system (currently, with cross-listing, no model exists).
References and Footnotes

(3) Penn State document on the assignment of shared credit with accompanying form. http://www.mri.psu.edu/ematerials/v01i04/ASC.pdf.
(6) Guidelines for shared credit authorship can be found at http://www.icmje.org/