

**GEORGE MASON UNIVERSITY
BOARD OF VISITORS**

**Research Committee Meeting
September 24, 2015
Merten Hall, Fairfax Campus**

A G E N D A

- I. Call to Order**
- II. Approval of Research Committee Minutes: May 6, 2015 (ACTION ITEM).....F-2**
- III. Chairman’s Goals for the YearF-6**
- IV. Office of Research and Economic Development Reorganization**
 - A. ORED 2.0 Report (C. Cioffi).....F-7
 - B. VP Research Search Update (P. Agouris)
 - C. Research Policy, Compliance and Safety (A. Dade and M. Laskofski).....F-41
 - D. Evaluating Progress: Carnegie “Very High” Research Classification (S.D. Wu)
- V. Research and Innovation Partnerships**
 - A. Update on Institute for Biomedical Innovation (S.D. Wu).....F-52
 - 1. How Can BOV help in Richmond?
 - B. Multidisciplinary Research Seed Grant Follow Up (P. Agouris).....F-60
 - C. Special Topic Briefing: Breast Cancer Research at Mason (E. Petricoin/L. Liotta)
- VI. Adjournment**

II. Research Committee Minutes from May 6, 2015 (2 pages + 2 pages attachment)

Research Committee Minutes from May 6, 2015 (2 pages + 2 pages attachment)

Research Committee Minutes from May 6, 2015 (2 pages + 2 pages attachment)

Research Committee Minutes from May 6, 2015 (2 pages + 2 pages attachment)

III. Chairman's Proposed Goals for 2015-2016

GEORGE MASON UNIVERSITY BOARD OF VISITORS RESEARCH COMMITTEE

General

1. **Increased Transparency and Communication.** Increase and enhance communication between Administration and BOV on research issues, needs, organizational structure, resources, and proposed changes to such;
2. **Enhance BOV Knowledge.** Inform BOV of the breadth and depth of GMU's existing research efforts to better understand needs and issues and to promote GMU's development goals;
3. **Identify Barriers to Research.** Identify barriers, administrative, cultural, and financial to assess ways to overcome them;
4. **Conclude Previous Tasks.** Ensure that previous requests of the BOV research committee for the last two years have been completed.

Current Activity

1. **Ensure Establishment of Metrics.** Ensure that metrics are developed and populated with data to enable BOV to evaluate progress toward Carnegie Very High Research with discrete data;
2. **Monitor and Review ORED 2 Task Force.** Review and monitor changes being proposed and implemented to better align resources, organizational structure with goal of Carnegie VH;
3. **Participate in VPR Search Committee.** Ensure selection of creative and energetic VPR with a vision who can move GMU's research mission forward;
4. **Advanced Biomedical Institute.** Monitor and ensure that new institute has funding, resources and leadership to stand up and begin operations, including better utilizing BSL-3 Labs and integrating it into institute operations;
5. **Legal Expertise.** Ensure hiring of attorney(s) for handling IP and compliance/export controls.

Impending Activity

6. **Engage and Operationalize GMU Research Foundation.** Integrate GMRF into GMU development and advancement plans, events, BOV Board meetings, planning, and fundraising, identifying IP with translational value and encouraging private-public collaborative efforts;
7. **Revitalize Research Council.** Revitalize research council, seeking its assistance on BOV research issues and getting briefings from Council on research issues from faculty perspective;
8. **Research Policies, Compliance, and Safety.** Ensure the review requested by BOV was completed and research policies have been reviewed, updated, consolidated as necessary, and made easily accessible;
9. **Establish IP Review Committee.** Ensure creation of IP committee as stipulated by Research Policy 4003, with goal of reviewing GMU's IP holdings and disposing or promoting as appropriate;
10. **New Multidisciplinary Institute.** Monitor progress toward creation and standup of new multidisciplinary institute dealing with non-traditional security threats, cyber security;
11. **Mason Korea (Songdo).** Evaluate prospects for and promote research activity taking advantage of Korean industry; outline plan for how to proceed.

IV. Office of Research and Economic Development Reorganization, Section A.

ORED 2.0 TASK FORCE REPORT

Claudio Cioffi, Interim Vice President for Research, Office of the Provost

JULY 1, 2015 ¹ – INTERNAL USE ONLY

This report summarizes work accomplished by the Office of the Vice President for Research (VPR) and the ORED 2.0 Task Force (TF). The report contains the following sections, each based on reports by corresponding working groups:

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¹ This version is based on revisions to the May 12 version, following discussions with Provost, TF members, and ORED staff; and further editing of the June 9 version.

1. EXECUTIVE SUMMARY

Highest Priority Recommendations

The following are the highest-priority recommendations in this report, based on strong support from faculty and administrators, and approved by Provost David Wu on July 1, 2015. They are also directly related to achieving Mason's strategic goal of obtaining Carnegie Very High Research Activity (VHRA) status.

1. Reconstitute the Office of Research Development with full capacity as soon as possible, as a key strategic enabler for achieving VHRA level, fully capable of supporting a large number of concurrent multi-disciplinary and multi-institutional research grants.
2. Ensure viability of the Office of Research by adding personnel and resources to the central office of the Vice President of Research (VPR), the Office of Sponsored Programs (OSP), the Office of Research Integrity and Assurance (ORIA), and the Office of Research Computing (ORC). This is also essential for VHRA.
3. Begin development of the university budget model for research units (centers and institutes) to create a new distribution for indirects (external revenue in a grant's budget to fund facilities and administrative operations related to research projects, also known as "overhead"), which is also essential for achieving VHRA.
4. Recruit new and junior faculty with an informed emphasis on the University's VHRA goal, and consider the goal in performance evaluations and transitions.
5. Treat research centers as key players in attaining VHRA status.
6. Decentralize the Faculty Study Leave program to academic units, and announce this change by end of August 2015.

The Office of Research and the Research Council may recommend other priorities. This is an overview, and the remainder of this report contains many other recommendations grouped by subject.

2. GUIDING PRINCIPLES AND ASSUMPTIONS

Consistent with the Provost's strategy and Mason's Strategic plan, the Vice President of Research (VPR) and the Task Force (TF) adopted the following Guiding Principles by consensus:

1. **Network Organizational Strategy and 60/40 Principle:** All units (i.e., administrative, academic, and research units of the University) should focus 60 percent of their effort on their individual mission, vision, and goals. The other 40 percent of their time and effort should be dedicated to assisting other units, and all the units will receive assistance in return.
 - For TF purposes, this principle applies mainly to the reorganized Office of Research (OR 2.0). The TF's Working Group 1 (focused on Office of Research Development Strategic Planning) may also consider whether it should apply to senior faculty and which implementation recommendations, in terms of annual unit and personnel evaluations, would be necessary. The 60/40 Principle requires champions and an implementation plan that includes measurement guidelines to ensure accountability. **Recommendation:** Issue a policy memo announcing the 60/40 Principle under Provost's signature. Communicate the new policy via multiple channels, emphasizing that this is a significant cultural shift at many levels, including performance evaluation.
2. **Separate Collaborative Divisions:** "Research" and "Entrepreneurship and Innovation" (formerly "Research and Economic Development") will constitute separate organizations – the Office of Research (OR) and Office of Entrepreneurship and Innovation (OEI), respectively. The VPR is head of OR, whereas OEI will have its own leader (Associate Provost for E&I). All senior leaders including the Vice Presidents and Associate Provosts will collaborate to implement the network strategy and 60/40 Principle.
 - Separation does not imply isolation. The Office of Research and the Office of Entrepreneurship and Innovation will be expected to collaborate through close consultation on applied and translational research and commercialization. **Recommendation:** Create a dotted line between the OR and the Office of Technology Transfer, which will become part of the Office of Entrepreneurship and Innovation – similar to that between OR and the Office of Research Computing (ORC).
3. **Faculty Awards:** The Associate Provost for Faculty Development and Enrichment (presently Kim Eby) will manage some faculty awards previously handled through the Vice President of Research's Office of Research Development.
 - The Office of Research will continue to administer some awards as suggested by the working group. **Recommendation:** Communicate the changes in awards

administration through multiple channels and initiate immediate changes to the Study Leave program as call for proposals should be issued in August 2015.

4. **Principle of Highest Expected Yield:** The main mission of the Office of Research is to encourage and enhance research that is multi-, inter-, or trans-disciplinary (multidisciplinary, for short), i.e., research created by synergistic collaboration across units. The Office of Research will build and strengthen a research infrastructure that supports externally funded research across the campus. Most research is conducted within the boundaries of individual academic disciplines and is the responsibility of those units, except for research deemed highly relevant to Mason’s strategic mission and goals.
 - “Cost centers” are research assets, such as equipment and facilities, that serve several units—for example computer clusters or other computing facilities, undesignated research space, or instrumentation used by a broad spectrum of academic units or research centers. **Recommendation:** Communicate this change through multiple channels.

5. **Task Force Structure:** Given its complex vision and goals, and the previous plans announced by the VPR, the ORED 2.0 Task Force operated in two modes: *plenary* as a whole with group oversight, and *compact* through smaller working groups focused on specific issues. Several dozen issues were identified initially, and larger research issues were aggregated into a smaller set and assigned to Working Groups (WG) as follows:
 - WG-1: Strategic Planning
 - WG-2: Research Proposals
 - WG-3: Research Centers
 - WG-4: Legal Issues
 - WG-5: Faculty Grants and Awards

3. STRATEGIC PLANNING²

This section outlines the foundation of a Strategic Plan for the Office of Research under the previously described Guiding Principles, with a view toward completing and implementing the plan. The foundation of the Strategic Plan, presented here with recommendations, consists of the following three components:

1. Mission of the Office of Research
2. Vision
3. SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats)

3.1 Mission of the Office of Research

The Mission of the Office of Research at George Mason University is to support the University-wide goal of attaining Carnegie Very High Research Activity (VHRA) status, and enable the University to thrive. This Mission is the core motivation of this report.

This mission statement, announced to administration and faculty in Fall 2014, has the following features:

- A developmental, not static, aspirational mission. As the VHRA goal is attained, another spiral in strategic planning should continuously assess the state of the OR and Mason research and make necessary adjustments.
- An annual research expenditure goal in the range of \$200 – \$300 million.
- Committed support of Goals 10 (Elevate Research) and 11 (Research of Consequence) in the University’s Strategic Plan 2014–2024, in collaboration with other administrative and academic units of the University, based on the 60/40 Principle.
- An equal balance between pure and applied research.
- No merit distinction between multi- and single discipline research, although significant increases in multidisciplinary research will be necessary to achieve and maintain VHRA status. Multidisciplinary research will be the priority, but research within disciplines with demonstrable university-level value will also be supported.

Recommendation: Although research is explicitly mentioned in Goals 10 (Elevate Research) and 11 (Research of Consequence) of the University’s Strategic Plan 2014–2024, the President, the Rector, and the Provost should reaffirm these research goals and provide specific resource support in a campus-wide communication to reassure faculty.

3.2 Vision

Recommendations from the Summer 2014 National Council of University Research Administrators (NCURA) Review Panel Report (see sections below) and ORED 2.0 Task Force

² This section is based on an earlier report by ORED 2.0 Task Force Working Group 1 – Strategic Planning.

recommendations (detailed in each section of this report) are implemented and Mason is operating as a VHRA university by 2020.

This is a summary Vision statement of the desired end-state. It assumes that the University will proceed in implementing the report's recommendations covering critical personnel, organizational, and programmatic areas including needed investment in resources necessary to increase the University's research activity.

3.3 SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats)

This was the largest Working Group, due to the comprehensive and complex nature of the task and the large number of issues that concern Mason research.

Members of this Working Group included:

- Claudio Cioffi, VPR, Chair
- Peter Barcher, Associate Vice President of Research and Interim Director, ORD
- Kenneth De Jong, Director, Office of Research Computing
- Michael Laskofski, Director, Office of Sponsored Programs
- Aurali Dade, Director, Office of Research Integrity and Assurance
- Julie Zobel, Director, Environmental Health and Safety
- Members with strategic planning experience (Kim Eby, Priscilla Reagan, among others)

The SWOT Analysis was conducted in the following stages:

1. VPR drafted a preliminary list of issues based on input from faculty members, administrators, and staff, as well as his own experience as a researcher at Mason.
2. The preliminary listing of SWOT items was presented to the plenary WG and each item was discussed.
3. Members of the WG-1 reviewed, discussed, and edited the VPR's initial list in separate sessions absent the VPR.
4. The VPR collated all amendments and results from the previous process.
5. A second round of comments by the full Task Force was undertaken in early June, producing a further version.
6. Final comments were received in the second half of June, producing the version reported here.

The following items resulted from the SWOT Analysis. When appropriate, **Recommendation(s)** and Action items (in bullets) accompany each item.

STRENGTHS:

1. Some ambitious, qualified, and entrepreneurial faculty members who are committed to producing high-quality research that influences policy and practice. **Recommendation:** Ask the Research Council to review current research-related incentives and rewards to ensure Mason becomes highly encouraging for faculty in terms of research activity.
2. Positive team collaboration in pockets of highly successful multidisciplinary research. **Recommendation:** Identify top collaborative research teams at Mason and recognize them through University publications (website, magazines, etc.) at least once a year: Mason Research Day, Dec. 11 (George Mason's Birthday).
3. Key faculty already operate at the VHRA level in distinguished research programs and centers with local, regional, national, and international salience. **Recommendation:** Identify faculty already operating at VHRA level. Recruit one or more to serve on the Research Council as at-large member(s).
4. Location near research-funding agencies. **Recommendation:** Invite funding agency officials to visit campus, tour labs, and meet researchers. Invite them to special events, such as Mason Research Day on Dec. 11. Continue highlighting the proximity to DC in marketing materials and faculty recruitment in line with Mason's strategic plan.
5. VHRA-level faculty has deep experience and knowledge of critical funding opportunities. **Recommendation:** Identify these top-performing faculty and recruit more equally qualified faculty. Encourage more research partnerships with VHRA universities.
6. Strong existing research-support program. The National Council of University Research Administrators noted these practices in their 2014 Report. **Recommendation:** Continue to recruit and support excellent research-support personnel through competitive salaries and provide them with opportunities for ongoing professional development. Develop and communicate a tone of consistent support from top Mason administration.
7. With Mason's Schools, the University's existing multidisciplinary-chartered Institutes – such as the Krasnow Institute for Advanced Study, the Institute for Advanced Biomedical Research, and others – provide a strong foundation for expanding multidisciplinary research. **Recommendation:** Provide additional incentives for further development of these institutes and others. Ensure their participation at Mason Research Day, Dec. 11, by engaging them in planning.
8. NoVA culture of interest in Research, Science, and Technology dates back nearly 300 years to the colonial period (George Washington, George Mason, Benjamin Banneker, and others). **Recommendation:** Conduct research and write brief report with assistance from Fenwick Library, Department of History, and special collections, in addition to marketing efforts highlighting documented historical roots.
9. Existing large-funding programs at agencies: NSF, ONR (MURI), NIH, etc. **Recommendation:** Document these large, multidisciplinary, multi-year programs because they are not widely known to faculty (e.g., the numerous SEES programs at NSF, and its successors).

10. Indirect costs distributed to academic units and investigators. **Recommendation:** Increase the proportion of Facilities & Administration and Indirect Cost Recovery received by research institutes and centers. (The new university budget model for research units will address policy on indirects. Currently, only the new budget model for academic units is completed.)
11. The recent Multidisciplinary Research Symposium on Health was successful and generated momentum. **Recommendation:** Use momentum to propose additional themes, such as Climate and Sustainability, Security (homeland, national, global, and cyber), among others.

WEAKNESSES:

1. ORED, and specifically the Office of Research (ORD) is under-staffed and under-resourced. **Recommendation:** Restore sufficient and appropriate expertise, capabilities, and resources within ORD to achieve VHRA status, consistent with the new organizational chart included in the Appendix. The office of the VPR must have a defined, adequate budget to develop and ignite new research opportunities.
2. Insufficient seed-grant funding. **Recommendation:** Provide new seed-grant funding using the University's budget, funds from Facilities & Administration (F&A), and Indirect Cost Recovery (ICR) monies from grants and awards. The goal is to increase seed-grant funding 15–20 percent annually for the next five years.
3. Insufficient start-up funds for new faculty and lack of centralized funds to hire potential faculty's partners. **Recommendation:** Increase funding based on our close competitors, using ICR.
4. Lack of re-investment of F&A/ICR funds in research. We need a more transparent and research-supportive distribution of F&A funds, as well as credit assignments, to enable more cross-unit collaboration. The current practice of using recovered F&A funds to cover operational deficits unrelated to research means that these resources are not available for crucial research infrastructure and investment needs. **Recommendation:** Re-invest F&A/ICR in research domains, not other activities. (This recommendation concerns changes in indirects, which await the new budget model for research units.)
5. Insufficient central resources to maintain and expand capital equipment and lack of transparent metrics for distribution of Virginia Equipment Trust Fund (ETF) money. **Recommendation:** Invest F&A/ICR in an internal capital equipment fund and develop transparent and published metrics for ETF fund distribution.
6. Young university with fledging traditions and small/weak alumni support for research. **Recommendation:** Highlight existing traditions and historical references, working with the Board of Visitors to achieve this goal. Create a category of "Alumnus Emeritus" or "Alumna Emerita."

7. Commuter-college legacy, non-research image among the general public. **Recommendation:** Increase research communication, especially Mason inventions and discoveries by Mason researchers. Make faculty researchers aware of communication possibilities and channels, using training/education, examples, etc. Fund and implement an outward-facing marketing communications plan and staff including a web developer to address key audiences in sync with other VHRA institutions.
8. Noncompetitive support for Graduate Research Assistants (GRA). **Recommendation:** Increase GRA support by creating endowed fellowships.
9. Contentious indirect-cost distributions. **Recommendation:** Overhaul the university policy on distribution of F&A/ICR funds. Increase funding to research centers and institutes. Reallocate funds from underperforming centers and institutes. (This recommendation will be addressed in the new budget model for research units that the University is developing.)
10. Problematic credit assignments to units. **Recommendation:** Review credit assignment policy, detailing its consequences, and recommend improvements for implementation.
11. Lack of collaboration across units (in fact, negative competition). **Recommendation:** Increase cross-unit research collaboration via centers, institutes, and new incentives.
12. 80/20 distribution of faculty research productivity (power-law). **Recommendation:** Reward faculty research productivity by increasing share of ICR distribution and other incentives (“moving the cheese”) and instituting post-tenure review process.
13. Geographically distant campuses. **Recommendation:** Improve telecommunications capacity, including quasi-24/7 active telecom among selected sites.
14. Office of Research Development has been severely under-staffed for three years since previous Director departed. **Recommendation:** Restore ORD to function with capacity sufficient for VHRA status.
15. Under-resourced Office of the Vice President of Research (OVPR) **Recommendation:** Increase resources at the OVPR using F&A/ICR funds and university budget for research.
16. Research micromanagement by the Board of Visitors (BOV) relative to other VHRA universities. **Recommendation:** Observe proper institutional procedures and channels. Encourage the Mason development office to enlist BOV members in fund-raising for research, specifically, and give them specific targets. Other universities do this.
17. Missing synergy among OVPR and other offices (divisions). **Recommendation:** Increase visibility and collaborations.

18. Poor external communication of Mason research, albeit recently improved. **Recommendation:** Maintain improvement momentum by increasing research communications, staff, and resources. Hire a web developer. Improve media outreach and publications, provide news release templates for researchers and centers, and practice other means to increase communication.
19. Weak GMU Foundation in support of Mason research (e.g., access to private philanthropy). **Recommendation:** Explore possible solutions, including meeting with President and staff of the George Mason University Foundation, brief them and provide information.
20. Loss of Nobel laureates. **Recommendation:** Highlight past contributions and support new hires.
21. Lack of National Academies members. **Recommendation:** Assess membership in National Research Council (NRC) panels and other NAS (National Academy of Sciences), NAE (Engineering), NAM (Medicine) bodies and events. Promote memberships by VHRA Mason faculty.
22. Lack of clarity about research centers. Programs and the population of research centers are unknown, and, in some cases there are redundancies and productivity is low. **Recommendation:** Conduct a university-wide census; establish University Research Centers as a specific class funded by the Office of Research (OR) and grants. Use alternative designations – such as lab or workshop – to units not approved as Centers by OR.
23. Inadequate Travel Office rules for VHRA. **Recommendation:** Assess the role of the University Travel Advisory Committee (UTAC) in terms of travel-related issues that arise in the conduct of research. Require the Travel Office to accommodate research travel requirements and review them annually.
24. Inadequate research-equipment inventory procedures from Fiscal Services' Dept. of Equipment Inventory. **Recommendation:** Request confirmation and changes from previous year rather than complete inventory each year.
25. No clear policy, lax planning and no enforcement of deadlines to submit proposals on time. **Recommendation:** Communicate significance of systematic planning and provide workshops and other opportunities to foster best practices. Enforce deadlines.
26. Poor recruitment and retention of faculty with an eye to future research contributions, and lack of a commitment to retain the most productive researchers. Some of our faculty comes with amazing backgrounds and great potential, but as they become productive other universities poach them. **Recommendation:** Improve R&R packages making strategic use of F&A/ICR funds. Develop specific dollar amounts necessary, depending on disciplines

and multidisciplinary domains. Estimate what it will cost to reach VHRA-level in recruitment and retention.

27. Lack of administrative training for research leaders such as center directors, Principal Investigators (PIs), and Co-PIs. **Recommendation:** Provide training specific to leadership in research centers. Develop a model for research-center directors, inspired by the SES (Senior Executive Service) of the US Federal Government.
28. Distance from Richmond. **Recommendation:** Interact more frequently with Richmond-based personnel at all levels. The Office of Research works with Mason's Office of Government Relations.
29. Mason has no consistent commitment to fund research salaries, facilities, and equipment. Talented faculty who could contribute significantly through research projects and strengthened academic programs eschew Mason because of its poor resources and pay. With adequate compensation and facilities they could increase external funding, support GRAs and Postdocs with competitive packages, and contribute to the growth of single-discipline and multidisciplinary cores of excellence. **Recommendation:** Increase funding for campus-wide, multi-user research resources prioritizing computing and similar facilities and equipment.
30. Indirects not being used 100 percent to fund research. **Recommendation:** Review and rebalance F&A/ICR distributions in favor of research activities, revising the Routing Form accordingly. (This recommendation concerns changes in indirects, which must await the new budget model for research units.)

OPPORTUNITIES:

1. New senior administration supports research. **Recommendation:** Advance the research strategic goals.
2. Widespread support for increased computing infrastructure, for research, including hardware, software, and support personnel. **Recommendation:** Develop a plan to grow the Office of Research to support VHRA goal, based on current strategy of user contributions and a common resource approach.
3. Launch new Multidisciplinary Research Initiatives (e.g., April 27 symposium). **Recommendation:** Coordinate ORED 2.0 with the Multidisciplinary Research Initiative. Encourage other topics in addition to Health & Biomedical, such as Climate & Sustainability, Security (homeland, national, global, and cyber), among others. Write a five-year plan synchronizing the most productive centers with Mason's goals, and allocate funds systematically. Think critically and strategically about these topics. Focus on historical strengths and consider issues that concern the region and the nation. Focus on areas of robust opportunity – the topical analyses are critical and must engage the full breadth of STEM, including social science, and humanities.

4. Separate research and economic development functions in the reorganization of the OR. **Recommendation:** Track change and coordinate the Office of Technology Transfer as a dotted-line report to the VPR, similar to Office of Research Computing.
5. Increase participation in generously funded federal programs: NSF (SEES), ONR (MURI), NIH, etc. **Recommendation:** Assess and disseminate information to faculty and coordinate limited-submission proposals.
6. Create new undesignated research space (e.g., Academic VII and Fenwick Library). **Recommendation:** Assess available space, and plan to utilize undesignated space effectively. Communicated this information (facilities, availability, conditions, etc.) to faculty and other stakeholders.
7. Several pro-research BOV members. **Recommendation:** Foster positive relations with BOV members. Coordinate this activity through President and Provost. Encourage BOV members to lobby government funding agencies and seek support from corporations and non-profits that fund research.
8. Pro-research attitude in Richmond, including significant support for new Biomedical Institute, and the Commonwealth's grant proposal to fund federal relief for natural disasters and coastal flooding, etc. **Recommendation:** Foster positive relations with stakeholders in Richmond, especially through research and grant activities, such as the large Veterans Administration proposal to HUD and others like it.
9. Valuable memberships in consortia (e.g., VA Sea Grant, The Catalyst). **Recommendation:** Assess current memberships and disseminate information via the Research Council and the Office of Research Development (ORD).
10. Attract new research centers to Mason (e.g., Public Choice, COLA, CRASH relocation). **Recommendation:** Assess status of prospective centers within and outside Mason and estimate needs. Meet with prospective directors and schedule personal visits.
11. Pro-research attitude of other external stakeholders (e.g., Northern Virginia Regional Commission). **Recommendation:** Foster collaborative relations with most promising external network.
12. Adjust renewal, promotion, and tenure processes to reflect realities for faculty who participate in multidisciplinary research, particularly for junior faculty. **Recommendation:** Propose guidelines to the Vice President of Academic Affairs, and also consider teaching as a route to tenure.
13. Research strengths beyond STEM (Science, Technology, Engineering, and Mathematics) fields. **Recommendation:** Assess all fields for externally funded research potential.

THREATS: A recommendation for all items in this category is to assess each risk in terms of likelihood and potential losses.

1. Further critical loss of OVPR/ORD capacity due to retirements and retrenchments. **Recommendation:** Avoid further loss of capacity by "holding the line" and undertake change toward ORED 2.0. with appropriate consideration for contentious issues.

2. Further decreases in general state funding. **Recommendation:** Prepare for further decreases in VA funding while making maximum use of funds available. Lack of preparedness increases potential for disaster. Fundraise harder while seeking *new* sources of outside funding in addition to the usual government sources.
3. Same for overall federal research funding agencies (not universal). **Recommendation:** Estimate scale of further possible cuts over next 5-10 years.
4. Loss of productive faculty because of uncompetitive salaries and support. **Recommendation:** Identify critical faculty, raise their salaries, and provide them with adequate resources to conduct effective research and attract funding.
5. Retirement incentive program will replace senior faculty with junior faculty, with differential effects depending on disciplines. **Recommendation:** Estimate extent and location of this hazard.
6. Pervasive perception that current Mason administration does not really support research. **Recommendation:** Provide multiple lines of evidence to the contrary.
 - a. Follow through with ORED 2.0 and recommendations in this Task Force Report.
 - b. Implement top priority 2014 NCURA recommendations.
 - c. Disseminate information supportive of research activities.
 - d. Increase funding significantly and communicate the fact widely.
7. NoVA invasion by other universities (e.g., Virginia Tech at Ballston). **Recommendation:** Prepare a counter-strategy. Raise the issue with Provost, President, and BOV. Co-opt intruders.
8. Organizational separation of the Office of Technology Transfer (OTT) and Mason Enterprise Center units may hamper applied or translational research. This part of the reorganization is not universally supported, so it will be under scrutiny by some stakeholders. **Recommendation:** Ensure this does not occur, by maintaining applied and translational research activity. Maintain dotted-line reporting of OTT, similar to the Office of Research Computing.
9. Confusion concerning centralization vs. decentralization. **Recommendation:** Clarify essential differences, and communicate through a variety of channels.
10. Lack of preparedness planning, in spite of the fact that problems will occur moving toward the VHRA level; some problems can become disasters when there is little preparation, high vulnerability, and weak response. **Recommendation:** Educate stakeholders about disasters, preparedness, and relation between the two and other factors (hazard size, vulnerability, response). Communicate that being prepared can prevent, avoid or mitigate disasters.

4. RESEARCH PROPOSALS³

There are significant research proposal issues, which were deemed major by faculty and administrators. Currently, these fall under the Office of Research Development (ORD) and the Office of Sponsored Programs (OSP):

- Late or un-reviewed submission of proposals
 - Multidisciplinary (cross-unit) complex proposals
 - Limited-submission proposals

Mason's volume of proposals increased significantly over the past several years. The number increased 53 percent between 2007 and 2014 (see Figure 1). Although the majority of proposals are submitted to federal agencies (see Figure 2), George Mason has a diverse portfolio of federal-funding sources in a wide range of areas. The result is greater variability in the types of proposals developed, and increased complexity in proposal preparation and submission (see Figure 3). The competition for external funding is greater, and sponsors routinely add compliance requirements. This applies to both federal and non-federal funding.

The Proposal Workgroup has identified the following observations and recommendations. Since proposal preparation and submission was examined and analyzed closely during the April 2014 National Council of Research Administrators (NCURA) review, where appropriate we have referenced the relevant sections of the NCURA report.

4.1 Lack of A Research Development Office

Most research development offices at research universities provide general support functions, such as identification of funding opportunities, coordination of large, multi-disciplinary projects, limited submissions, maintaining faculty expertise databases, and outreach/training. Some universities also offer proposal writing and editing services.

Below are a few examples of Universities with Research Development Offices worth emulating. The University of Maryland offers a library of successful proposals to their faculty. That may be helpful for some programs, such as National Science Foundation Careers.

<http://research.unl.edu/proposaldevelopment/proposal-development-services/>

<http://research.ufl.edu/faculty-and-staff/finding-funding/research-program-development-office.html>

<http://www.research.umd.edu/development/services>

³ This section is based on an earlier report from ORED Task Force Working Group 2 – Research Proposals.

Research Development was addressed directly in the NCURA Peer Review. Below (in italics) are the relevant sections related to the research development function.

Deans and faculty expressed concern that the lack of a research development function that could assist with large, complex proposals would hinder the institution in its research goals. In addition, faculty stated that there was little lead time to internally propose and to submit internal and limited submission applications. Given that most research intensive institutions have some structure for proposal development, specifically to address the needs of multi-disciplinary and “big” science, GMU should consider the repositioning of its Office for Research Development as a staffed and dedicated office for this pursuit in order to be competitive with other research institutions.

The institution provides faculty, staff, and students’ access to information on prospective sponsors (such as federal, state, local, private foundations). These constituents are provided tools and assistance as appropriate to the culture of the institution, the level of activity, and the relative importance of research in strategic goals.

The GMU Office of Research Development web site provides the community with a list of available subscription services provided by the university including SPIN and The Grant Advisor, as well as quick links to grants.gov, NIH and NSF homepages, and the US Government Challenge web site. Because the office is currently in flux, this site and the information it contains runs the risk of becoming outdated and not useful to research faculty and staff. The information provided, while helpful to the novice investigator, is not particularly robust. The SPIN resource can be particularly useful to investigators who take the time to set up alerts. The Office of Research Development previously offered individualized consulting sessions to faculty and research staff on the identification of funding opportunities and advised on appropriateness of funding sources and strategies for interactions with agencies. But with the closing of that office the Reviewers noted a lack of centralized assistance in this area. It is not clear at this point whether or not the Office of Research Development will continue to be a unit under the VPRED.

Recommendation: Re-establish the Office of Research Development with full functionality and capacity to achieve and sustain VHRA as soon as possible. Consider how re-establishment of ORD should take place in collaboration with colleges and their research offices.

Recommendation: Increase communication to faculty, specifically regarding the availability and use of systems such as SPIN and others.

An effective program in research development must begin well before decisions are made regarding the funders to which proposals will be submitted. An office such as this, headed by a faculty member who had experience and a long-term record in obtaining significant outside funding, in selecting appropriate funding, and in mentoring faculty as they develop a research career plan, could play an important part of GMU’s objective of significantly increasing research funding.

In addition to central resources, several of the units at GMU provide funding information to their faculty. The School of Public Policy, College of Humanities and Social Sciences, Volgenau School of Engineering, College of Health and Human Services, College of Science, College of Education and Human Development, and the Krasnow Institute of Advance Study all provide faculty with information on funding opportunities through a variety of avenues including targeted emails, mass email announcements, and information specific to college interests on their own web sites. The amount of information concerning funding opportunities varies widely on college web sites and in some cases appears to be at least year old.

Recommendation: The Office of Research Development should carry out the following activities, among others to be determined as the University transitions to VHRA level:

1. Provide pre-award and post-award support to a large number of concurrent multi-disciplinary and multi-institutional external grants or contracts.
2. Interact with and gather information from funding agencies (full spectrum, ranked by prospective grants and awards: public, private, federal, state, local)
3. Oversee research centers and research institutes, which includes a suite of mission-critical activities including, but not limited to:
 - a. Prioritize and promote development of multidisciplinary research on Mason signature themes (e.g., health & biomedical research; climate and sustainability; security – homeland, national, global, cyber; and others).
 - b. Encourage research collaborations on various scales.
 - c. Maintain a current database of Mason certified centers and institutes.
 - d. Charter new centers.
 - e. Review existing centers through internal re-charter or external review.
 - f. Oversee collaborations with external institutions/groups (e.g., Smithsonian Institution museums, centers, and programs). The Mason-Smithsonian relationship, in particular, is multifaceted and comprises more than the SCBI at Front Royal, so the full spectrum of collaborations needs to be assessed, communicated, and made operational by synergies with multiple Mason research centers and institutes.
 - g. Oversee external institutional memberships (e.g., ORAU, UCAR, HRAF, among others).
 - h. Assist in moving small or single discipline centers to colleges/schools.
4. Identify and communicate funding priorities.
5. Provide PI development assistance and faculty support.
6. Promote and co-develop multidisciplinary proposals with OSP.
7. Provide editing support to improve proposals.
8. Coordinate limited-submission proposals.
9. Provide seed funding for multidisciplinary grants.
10. Provide summer research grants.
11. Communicate Mason signature research to internal and external stakeholders.
12. Sponsor special events, such as workshops, training sessions, Mason Research Day (Dec. 11), and others.

Recommendation: Survey the Faculty to determine if they are receiving adequate information on funding sources. The feedback provided will help us communicate funding sources more effectively.

The Reviewers heard similar concerns from research faculty, members of the Research Council, and deans and directors about learning of funding opportunities too late to prepare competitive proposals. Several suggested that a re-established Office of Research Development could provide more timely information about these opportunities.

4.2 Proposal Routing-and-Review Processes

External reviewers made the recommendations in this and the next section from top-tier research universities in April 2014, after meeting with faculty, deans and administrators.

Late proposal submissions forfeit opportunities because they do not allow sufficient time for Institute Directors, Research Center Directors, Department Chairs, Deans, and others to provide input into proposals. Recommendations from the NCURA report are in italics below.

Recommendation: The Vice President for Research and OSP should develop and adhere to policy, to ensure that late or unvetted proposals will no longer be submitted.

There are a variety of process adjustments the University could implement to address this issue, but in order to be effective there needs to be improved compliance with the University's four-day proposal deadline. Since January 2010, non-compliance with the policy is approximately 60% for all proposal submissions. These results prevent timely proposal- routing approvals, impact limited pre-award resource allocations negatively, and increase the risk of missed deadlines.

Recommendation: The Provost, Vice President for Research, and the Associate Vice President of Research should make it clear to the GMU research community that the four-day rule is real because of specific, not arbitrary reasons. As a general policy, the deadline will be enforced, and OSP pre-award staff will not be expected to work overtime to process late proposals. Important last-minute opportunities may require special consideration.

4.3 Provide Sufficient Proposal Support

The number of proposal submissions increased annually for the past several years and we project increased growth. To ensure faculty receives the support necessary for proposal development, and the University submits the highest-quality proposals to increase funding, an appropriate support model should be developed. Below in italics are the NCURA recommendations.

OSP has deployed pre-award central resources within the School for Public Policy (one FTE funded 50% by OSP) and the College of Science (a part-time position to assist with its major research centers). The College of Education and Human Development (CEHD) is unique in that it has its own full-time and dedicated pre-award grants administrative support. Except for these cases, sponsored programs applications are compiled by the Office of

Sponsored Programs. Schools/colleges often have their own costing structures (e.g., stipends, tuition) and central staff does not have the familiarity to easily propose research project costs. This makes the budget development awkward and inefficient. In addition, it is very unusual in research-intensive universities for the faculty (assisted by local administrators) to be unable to upload a research application whether in COEUS, grants.gov or NSF Fastlane.

Recommendation: OSP and the Vice President for Research should re-evaluate the assignment of pre-award staff during proposal development and submission.

Recommendation: Staff and resources for OSP should be increased as a function of increasing research activity, assessing needs in relation to other research universities and best practices.

By assigning staff to specific units they are able to stay current on internal unit policies, develop a better understanding of the budget needs within the unit, and become team members with the faculty. Several groups with whom the Reviewers met voiced their concern about the lack of expert assistance in proposal development on campus. An outside consultant has been used to provide proposal development assistance on a limited basis but deans, directors, and research center directors reported mixed reviews from faculty who had used the consultant. The lack of in-house assistance is an ongoing concern for faculty and unit administrators.

4.4 Develop policies for indirect allocations and credit splits that facilitate increased cross-unit collaboration. (This issue could not be addressed in detail, due to lack of information on the new budget model for research units.)

Whatever policies are developed should set clear parameters that limit negotiation amongst individual faculty/units on routine transactions. The current process does not facilitate collaboration and at times results in increased tensions and even faculty walking away from opportunities because they cannot reach agreement on how to split small amounts of F&A.

F&A/ICR funds from research grants should remain in the domain of the University's research activities, as intended by funding agencies, so the primary destination of indirect allocations should be PIs, Research Centers, and Research Institutes. In the past, the distribution of indirects (below) has been marked by contention and extensive negotiations:

University: 30%

Provost: 35%

Principal Investigators: 10.5%

Department/Center: 7%

School/College/Institute: 17.5%

Recommendation: Adopt a new distribution formula with unequivocal preference in favor of research centers and institutes and the Office of Research, within the context of the new budget model for research units. (As of summer 2015 only the new budget model for academic units has been created, with initial implementation in Academic Year 2016.)

Recommendation: The University needs to develop a viable budget model for research, not just for academic activity. Without such a model it is impossible to clarify and redesign the indirects issue that is critical to attaining VHRA level.

At present, only the PI is assigned credit on sponsored proposals and awards.

Recommendation: For single-investigator proposals, the PI shall be assigned credit. For multiple-investigator team proposals with PI, Co-PIs, and other roles, the PI shall determine the allocation of credit, based on workload agreements.

4.5 Establish a faculty-mentoring program and review process, whereby senior faculty with an established track record for receiving sponsored funding mentor junior faculty.

Although George Mason has experienced growth in sponsored research over the past several years, the proposal preparation process needs improvement to achieve the goal of becoming a Carnegie Very High Research Activity University. There is strong support among faculty and administrators to developing systems, procedures, and structures that will help faculty seek external funding effectively and meet increasingly complex regulations.

Recommendation: Recruit additional senior faculty into the Research Council, for the purpose of providing “soup-to-nuts” research-oriented mentorship to junior faculty.

Recommendation: The Office of Research Development should offer talks, workshops, and other opportunities to develop the research skills of faculty.

Recommendation: Consider providing a one-semester faculty fellowship opportunity for junior faculty to intern at the Office of Research Development.

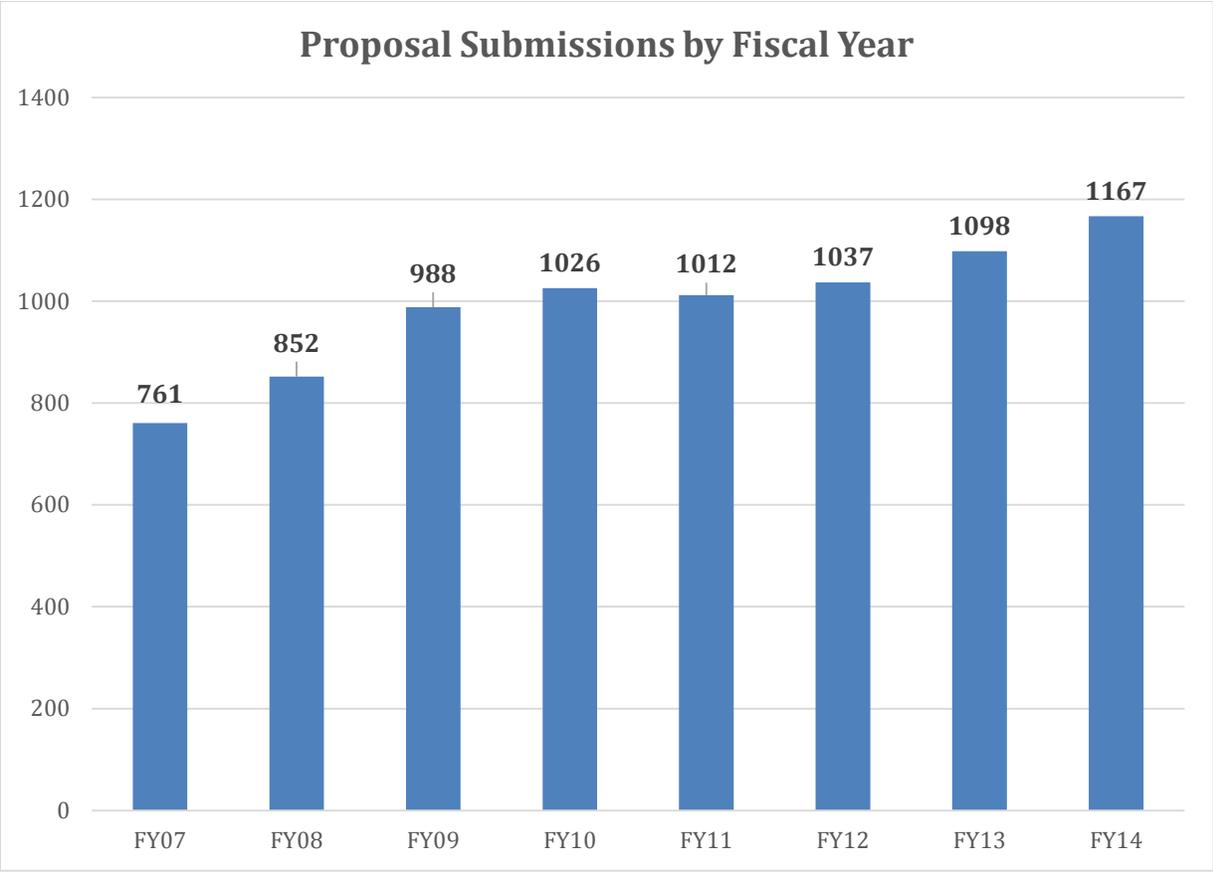


Figure 1 Proposal Submissions FY07 - FY14

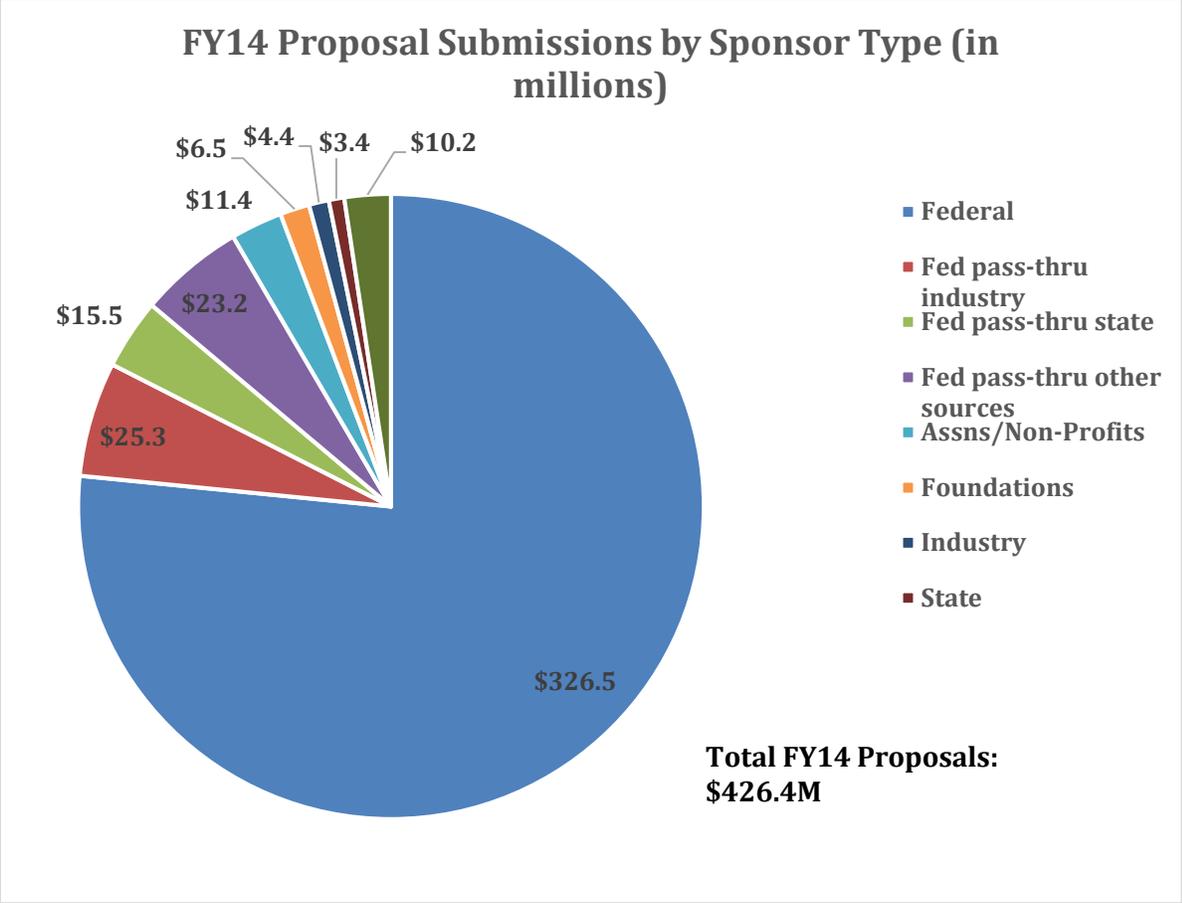


Figure 2 FY14 Proposal Submissions by Sponsor Type

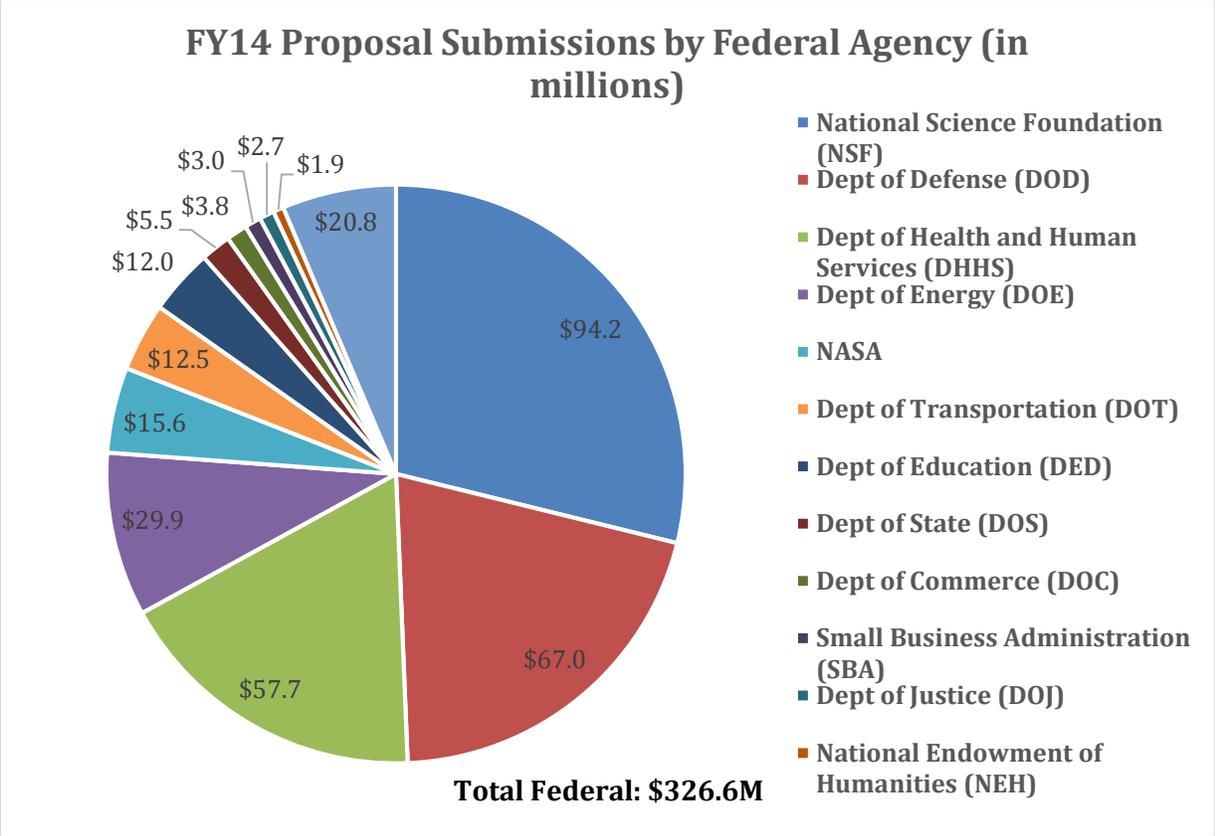


Figure 3 FY14 Proposal Submissions by Federal Agency

5. RESEARCH CENTERS⁴

Research centers have many critical concerns and issues under the current situation. They constitute mission-critical University research units, along with research institutes, for accomplishing the goals of ORED 2.0 and attaining VHRA status. **Research centers are to the research mission of the university as departments are to the academic mission.** The two missions should be balanced at a research university, as opposed to a primarily teaching college, so centers need to be elevated in organizational status moving forward to VHRA.

Recommendation: Acknowledge the parallel roles of departments and centers as prime units supporting the teaching and research mission of the University, respectively, granting department chairs and center directors comparable status and incentives.

Research centers are currently under the remnants of the Office of Research Development.

Examples of issues in this cluster include the following:

- Census of research centers, chartering, and re-chartering: Knowing what we have
- Leadership of research centers (director, associate director, staff) and training
- Joint centers for multidisciplinary research on convergent S&T

The TF WG-3 addressed these and related issues by identifying the four topics detailed below.

5.1 Maintaining the quality of research centers

The university has a number of small unproductive research centers. Also, several research centers appear to have considerable overlap. Viability needs to be assessed not only as a function of funding; impact needs to be part of the equation, since some fields require modest funding with high impact, others have high funding yet minimal impact.

Recommendations:

- The Office of Research Development bases the chartering process on a uniform set of guidelines and procedures covering all centers with STEM and humanities research activity.
- The Office of Research Development maintains a repository of documents and actions associated with the chartering process.
- The Office of Research Development focuses attention and provides primary support to multi-disciplinary research centers and research institutes, where multi-disciplinary is defined by participation of faculty investigators from a minimum of three or more academic units (colleges).

⁴ This section is based on an earlier report by ORED 2.0 Task Force Working Group 3 – Research Centers.

- The Office of Research Development develops clear expectations and measurable requirements for Institutes, Schools, Departments, or Colleges that seek chartering or re-chartering of centers with University-level certification.
- The Office of Research, assisted by the Research Council, exercises oversight over the implementation of these and similar functions.

5.2 Maintaining the viability of larger research centers

Mason assumes the overhead of research centers is covered in part through external funding. However, the amount of funding generated in this way is often insufficient to support the administrative needs of the larger centers, so currently some centers receive supplementary financial support from their Deans.

Recommendations:

1. Study centers' administrative costs to determine their magnitude based on their size and type of research.
2. Find out how centers are funded in the research institutes and academic units such as schools and colleges, since the policies vary.
3. If necessary, adjust the funding policies for centers so that they can be self-sufficient. If the costs vary with the size of the center, then funding should too.
4. The Office of Research Development should assist research centers in developing viable budgets, based on realistic expectations of external funding.
5. It should also establish policy for central support of those centers whose trajectory suggests success but who aren't quite there yet.
6. Require larger centers (those hosting one or more multidisciplinary groups or research teams) to provide a Strategic Plan and operating budget in the chartering/re-chartering process.
7. Provide an official template for Centers' Strategic Plan, consisting of standard sections such as Mission, Vision, Objectives, SWOT Analysis, Budget, among others.

5.3 Policies for valuable but underfunded research centers

Develop policies for research centers that provide valuable research, but (because of their mission) are unlikely to attract significant external funding.

The Faculty Handbook states that research centers are expected to be self-sufficient. However, we anticipate that the university would like to maintain some centers that do valuable work but are unlikely to obtain much external funding.

Recommendation: Develop new policies for evaluating such centers. The new policies should consider:

1. The core faculty group and leadership of the center.
2. The center's theme in relation to the Intellectual Signatures of the University, the historical legacy of the University, and community Commonwealth and NoVA stakeholders.
3. The extent of the center's multidisciplinary contribution.

4. Other pertinent factors determined by the nature of the center.

5.4 Policies for multidisciplinary centers

A multidisciplinary research center is typically composed of faculty investigators drawn from three or more academic units (schools and colleges). For example, a typical source of external funding for a Mason multidisciplinary center would be NSF cross-directorate grants (SEES, HSD, IGERT, etc.). We need new policies to support, supervise, and evaluate multidisciplinary centers that cross school/college boundaries.

The university's encouragement of multidisciplinary research will lead to more proposals for multidisciplinary centers that cross school/college boundaries. Currently, most centers fall within a single school or college, and thus are managed by one of the deans.

Recommendation: Develop policies for evaluating and managing centers that cross school/college boundaries.

6. LEGAL ISSUES⁵

The fourth cluster of issues considered by the TF dealt with legal and regulatory issues:

Legacy issues requiring resolution

- Inadequate staffing to fully meet compliance obligations required by laws, regulations, and sponsors.
- Private Business Use.
- Legal support for Research.

Current issues

- No enterprise-wide process for evaluating research risks posed to the institution – no risk assessment or risk-tolerance assessment process. Level of risk acceptance needs to be defined.
- Lack of clear data-management guidance and infrastructure.
- Lack of a “Compliance Culture” and need for better communication – we need to institute a researcher-responsibility-awareness campaign.
- Unclear policy on exceptions.
- Need assessment of field-research needs.

Foreseeable issues

- Lack of infrastructure to support growth in biomedical research/health area and entrepreneurial activity.

⁵ This section is based on an earlier report by ORED 2.0 Task Force Working Group 4 – Legal Issues.

- Additional government requirements.

At present most of these issues are of most concern to the Office of Research Integrity and Assurance (ORIA), although these issues impact the whole research community across the University.

Like other universities, Mason operates in an increasingly complex regulatory and legal environment, due to expansion into new research areas, and the overall complexity of the regulatory landscape. The compliance burdens are cumbersome for institutions and investigators funded by federal grants and contracts (see National Science Board Report from March 10, 2014 titled *Reducing Investigators' Administrative Workload for Federally Funded Research*). Although Mason constantly seeks ways to reduce the burden of these requirements while meeting compliance obligations, investigators continue to find the myriad regulations that intersect with their work challenging and time-consuming. At the same time, financial support from the Commonwealth of Virginia is constricting, so investigators are encouraged to be entrepreneurial and innovative in their approach to research and commercialization of their Intellectual Property.

This WG was tasked with providing a bulleted list summarizing the most pressing issues in the area of legal and regulatory compliance. The task was given a timeline of three weeks for completion, plus a two-week extension provided to the whole TF. Given the timeline, the WG decided to focus on 8–10 issues of high importance.

6.1 Resolving Legacy issues

Inadequate staffing to fully meet compliance obligations required by laws, regulations, and sponsors. This issue has been raised repeatedly. Page 19 of the NCURA report notes for the Office of Research Integrity & Assurance (ORIA): “The NCURA Review Team observed a glaring lack of staffing for this Office...Even with the addition of IRB and IACUC staff (Institutional Animal Care and Use Committee), GMU should address adding additional staff in the areas of research integrity (e.g., conflict of interest and scientific misconduct) with the growth of research.” At the time of the NCURA visit, it appeared that two to three additional positions were slated to address this need, but that has not come to fruition.

An internal audit of ORIA, also completed in 2014, noted: “In general, ORIA’s support of the university’s research programs ensures compliance with the federal research regulations. However, the current staffing levels within ORIA present non-compliance risks to the university since the department does not have staffing redundancies which help ensure that compliance activities are/will be performed in the event that the individual with primary responsibility is absent.” Three additional positions have been requested to meet this need, but they have not been funded. To continue meeting compliance obligations and grow research, Mason’s ORIA must be fully staffed. Examples of programs that have been stunted because of current staffing shortages include:

- Required implementation items for the export-compliance program;
- Incomplete policies, procedures, and guidance for the Institutional Review Board and IACUC;
- Critical post-approval monitoring programs;
- Education in RCR;
- Enhanced outreach and guidance related to COI, and
- Additional support needed for implementing research misconduct policies.

Private Business Use. The 1986 Tax Reform Act limits activities in buildings financed with tax-exempt debt to those that benefit the public. Only 10 percent of building activities may be dedicated to private business use, which includes certain research contracts that do not fall into an authorized “safe harbor.” Until recently, Mason did not track private business activities. A committee was formed, but senior-level oversight remains inadequate. The faculty mandate to increase research funding will result in more private-business research awards. As these approach the 10 percent building limit, senior-level decision makers must manage the awards. Faculty will continue to be encouraged to develop intellectual property and spin-off companies. This limitation on private business use, and conflict-of-interest concerns related to use of public space for faculty businesses, limit Mason’s ability to provide support for these activities.

Legal support for Research. Many matters of research compliance operate under attorney-client privilege and require advice of counsel (whether internal or external). The university legal office lacks expertise in many of these areas. Although attorneys have been hired as administrative faculty and staff in units, certain issues still need support from the central legal team. This is because these local attorneys do not act as legal counsel for the university, and their activities are not covered under attorney-client privilege. Export compliance specifically relies on external counsel – a costly and time-consuming process.

Recommendation: An additional central university attorney should be hired for internal support of research-compliance obligations to attain VHRA.

6.2 Current issues

No consistent, universal risk assessment process or risk-tolerance policy. This was highlighted in the NCURA report on page 32. There has been some action related to Enterprise Risk Management (ERM) and governance with a reorganization of personnel by the Senior Vice President. An ERM Council will be re-energized after the spring semester and throughout Fiscal Year 2016. This group will perform a gap analysis, and develop an enterprise risk-assessment process and other ERM tools to address hazard, operational, financial, and strategic risks. These tools applied across the university will cover research. Risk-tolerance has not been addressed in any comprehensive manner. High-risk research activities with heavy compliance burdens have been accepted routinely without clear planning to ensure physical, staff, and infrastructure

compliance. Part of the enterprise risk-management process should carefully review the risks of new classes of research, developing risk mitigation and risk management teams for high-risk research opportunities.

Lack of clear guidance on data-management and infrastructure. The problem of inadequate infrastructure and staff, relative to the data-management obligations that we accept with our grants and contracts from federal sponsors, is a major deficit and requires separate consideration. There are new data-management obligations for controlled, unclassified information (including export-controlled data), as well as data-management obligations related to sensitive personal and health information obtained from human subjects. A working group provided a risk assessment for consideration by upper administration. Improved physical infrastructure and staffing remain critical to this area.

Recommendation: Provide an online inventory system for data management and another for equipment.

Lack of Compliance Culture and need for better communication – researcher responsibility-awareness campaign. The NCURA report (page 59) highlights the need for a compliance communication campaign, an idea that administrators second. This need was identified over a year ago at Mason. The former Provost committed to mandatory faculty training on their compliance responsibilities. A working group consisting of the Associate Vice President for Research Operations, the Assistant Vice President for Research Compliance, the Controller, and the Director of Education for Human Resources has been working on a concise online-training program on common compliance concerns. **Recommendation:** One or more representatives from VHRA faculty should be invited to join this group. This training addresses responsibility for management of sponsored projects, Responsible Conduct of Research (RCR), and responsibility for providing a safe work environment. **Recommendation:** Pilot this training in one of the colleges, garner faculty feedback, and modify training to ensure it is clear and appropriate.

Additionally, regular compliance meetings ensure that Mason researchers think strategically about this problem, while keeping in mind that the primary responsibility of faculty is to conduct research and that of the entire Office of Research is to facilitate it.

Recommendation: There is a need for a commitment from the Deans, Directors, Chairs, and Research Center Directors to support compliance and communicate with their faculty about its importance. Mason should ensure this happens by naming individuals/positions and dedicating resources to this effort.

Lack of clarity in policy documents on exceptions. The NCURA report (page 27) pointed out that exceptions are granted from policies without a process for exceptions being documented.

Recommendation: The offices that manage legal and compliance policies related to the research program should evaluate all policies and procedures and insert language about how and when exceptions will be made.

Assessment of field-research needs. Mason faculty frequently conduct field research in the U.S. and outside of the country. During field travel, researchers frequently encounter problems (e.g., hiring local individuals, paying for items with cash (and subsequent reimbursement), protecting research data, etc.). Often these expenditures and activities could not have been anticipated in travel plans.

Recommendation: Mason should assess policies related to field research and ensure adequate flexibility to address real-world challenges, within a framework of risk management.

6.3 Foreseeable issues

Lack of infrastructure to support growth in biomedical and health research, or to support entrepreneurial activity, as research portfolios expand at Mason's regional campuses. In a message to the campus community on April 24, 2015, President Ángel Cabrera highlighted the launch of the Institute for Advanced Biomedical Research and the new name of the Prince William County campus – the George Mason University Science and Technology Campus. He said, “we are strategically positioned to be at the forefront of biomedical research,” and “we are in a position to attract even more of the brightest minds from around the world.” This anticipated growth in biomedical research leads to an increased need for the legal support and compliance infrastructure, which is extensive in this type of work. There are many requirements related to health research, including compliance with HIPAA, regulatory staffing needs for FDA-regulated clinical trials, FDA drug/device approval processes, Good Laboratory Practices (GLP), and the need for Clinical Laboratory Improvement Amendments (CLIA). Mason will need better safety monitoring and better infrastructure for handling protected health information appropriately. Assessing and building these procedures may require hiring expert consultants. There are also ongoing costs for registrations and training.

Research infrastructure should respond to changes in Mason's use of regional campuses. For example, moving some engineering research to the Science and Technology campus will require an increase in chemical-safety procedures at that campus. This may warrant the hiring of a Chemical Hygiene Officer.

Government requirements: More regulatory requirements will be issued in the next few years. There will be requirements for controls on unclassified information, and an updated federal policy for the protection of human subjects. We must retool current office processes, and add oversight of the animal care and use program, when Mason starts working with USDA regulated species. Institutional conflicts of interest related to research are receiving more attention. The Environmental Protection Agency issued a requirement to address Institutional COIs, while other regulations and/or grant requirements may surface. Recent safety incidents in Federal laboratories raised questions about laboratory-safety oversight and regulation.

7. FACULTY AWARDS⁶

The lion's share of faculty awards should move from the Office of Research to other units – for example Study Leaves (sabbaticals), Junior Faculty Awards, and others.

Summer research funding is an award category that will remain the responsibility of Office of Research Development.

The Working Group discussed seven existing internal programs currently administered by ORD:

1. Seed Grants (\$5,000) and Creative Awards (\$1,000-\$5,000). ORD accepts unsolicited proposals throughout the year.
2. Study Leave for Tenured Instructional Faculty (leave may be taken for one semester at full pay, or for two semesters at half pay). Funding is available for 30–35 faculty study leaves annually (available funding has not increased even though faculty numbers have).
3. Summer Research Funding for Tenure Track and Tenured Faculty (\$1,000-\$5,000; average award is \$3,500).
4. Emerging Researcher, Scholar, Creator Awards (\$5,000 stipend).
5. Mason-INOVA Life Sciences Research Collaboration Fund. MOU from INOVA granted \$1 million to support grants including the pairing of Mason/INOVA researchers. This fund was spent. Awards will not resume unless INOVA renews funding.
6. Equipment Trust Fund (ETF) Requests. Funded by Commonwealth of Virginia, equipment wish lists are solicited by the Office of Research and then presented to the VPR for decisions. Items of \$20,000 or more may support “major” research efforts, especially those that engage multiple units within, or among, colleges.

The work group noted that the Provost inaugurated a new research program in the spring of 2015:

7. Provost Multidisciplinary Research Initiatives. The first initiative focuses on human health. Request for Proposals due 6/15/15. Tier 1: award up to \$50,000. Tier 2: award up to \$25,000.

⁶ This section is based on an earlier report by ORED Task Force Working Group 5 – Faculty Awards.

Recommendations:

1. Manage internal-funding programs (solicitations, reviews, awards, tracking, reporting) to determine the purpose and expected outcomes of each program.
2. Provide potential applicants with clear information on internal support for research, scholarship and creative works.
3. The Office of Research Development should manage programs designed to increase external funding, as a result of an internal award, with timely reports to the Vice President for Research. These programs include:
 - Seed Grants and Creative Awards
 - Virginia Equipment Trust Fund Requests
 - Summer Research Funding
 - Mason-INOVA Life Science Research
4. The Study Leave for Tenured Faculty program should be moved from the Office of Research to Colleges and Schools to streamline application review and ensure equitable funding, a standard procedure at most research universities.
 - Colleges and Schools are positioned to evaluate research and scholarly work in their disciplines; they can provide a more equitable review, and they are aware of workload issues.
 - Allocation of awards to Colleges should be formula-based (to be determined) in order to disperse study leaves fairly and proportionately.
 - Existing guidelines should be revised for the fall 2015 call for proposals – in accordance with prior conversations and in consultation with the Deans and/or their designees.
 - Study leaves should be reviewed, as they have not increased over the years.
5. Seed Grants and Creative Awards will not be accepting applications in the 2014-2015 Academic Year.
 - These two valuable initiatives both merit funding.
 - SEED grants and Creative Awards should be managed by the Office of Research Development, with final review and approval by the VPR.
6. The Emerging Researcher, Scholar, Creator Award has an unwritten criterion to make awards to those who generate external funds for their research.
 - If the purpose of this program is to recognize those who bring in external funding, that criterion should be made transparent to nominators, and the program name should be changed to reflect the true purpose of the award.

- If the purpose of the program is to recognize research, scholarship and creative works in all its forms (including unfunded work), the program should be reviewed and revised.

History of Distribution of Awards:

- Of the 22 awards made from 2007-2013 (from 92 nominations), 19 (86%) were made to faculty from Science, Engineering, and Social Sciences.
- From 2007-2013, three awards were given (one each) to Education, Public Policy, and Humanities.
- No awards were made to Health and Human Services, Visual and Performing Arts, Management, and Conflict Resolution, due to lack of nominations.

7. All units charged with managing internal-funding programs must provide administrative support to manage, track, and report information.

- Funds not spent by internal grantees within the approved project period must be returned for investment in other projects.
- Grantees who receive internal funds should submit final reports at the conclusion of their work.

8. Maintain data about internal funding programs, prepare reports, and inform the campus community on a regular basis to improve transparency and accountability.

- Data should include individual and summary information such as project director(s), name of research center, schools/colleges involved or co-sponsoring, project title, amount requested, and amount awarded by competition and by date.
- Analyze the effectiveness of programs that exist to increase external funding.

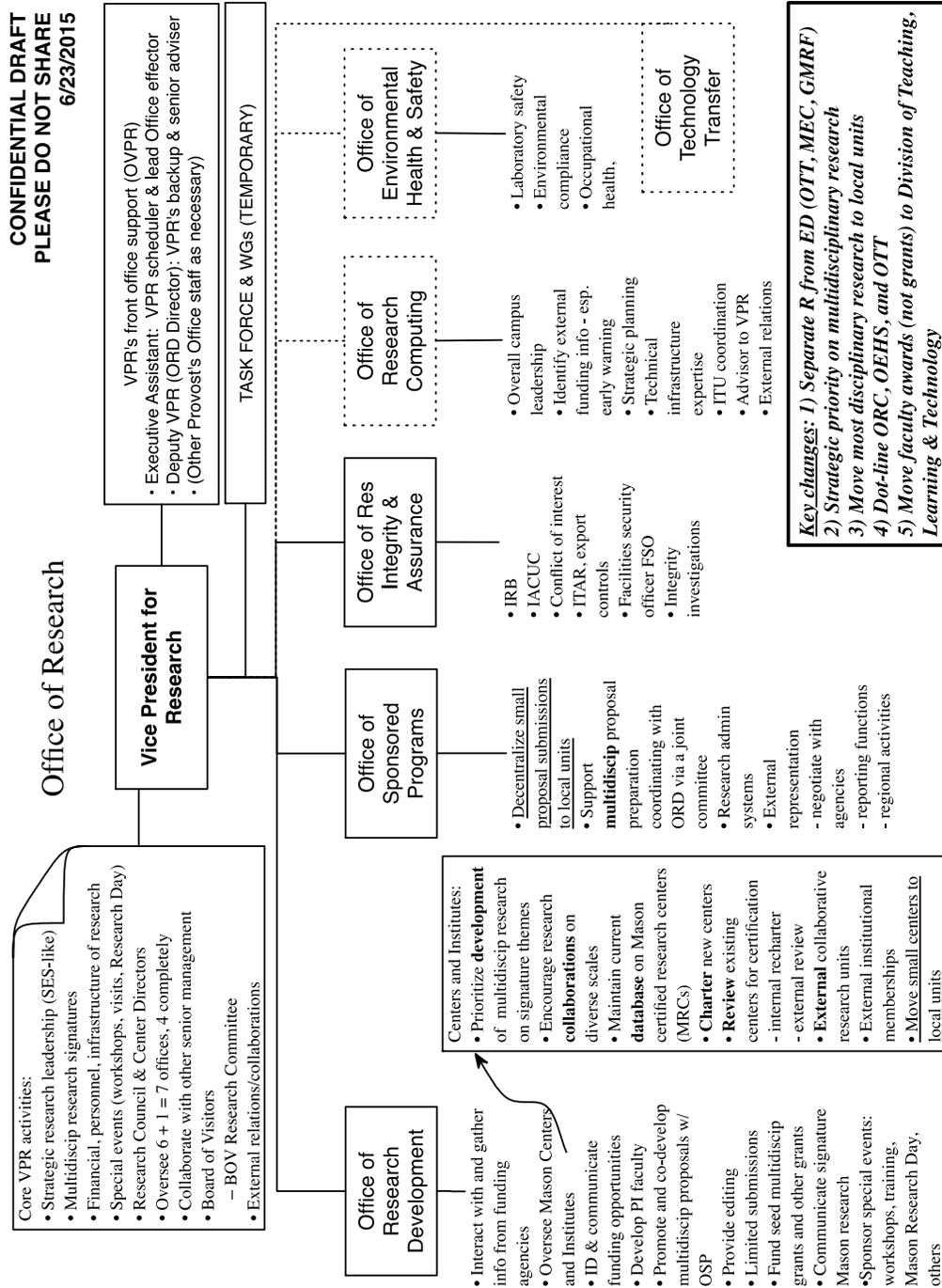
9. Awardees must acknowledge Mason support received from specific grants/awards, in all publications, products, and presentations – as is the norm for external grants.

TASK FORCE MEMBERS

All TF members participated in the WG-1 Strategic Planning SWOT Analysis, chaired by VPR Cioffi. Working Group leaders are highlighted in bold.

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Cing-Dao Kan	Professor & Director, Center for Collision Safety & Analysis
Kayne, Veronica	Director, Office of Technology Transfer
Michael Laskofski	Director, Office of Sponsored Programs (led WG-2 Proposals)
Stephen Nash	Senior Associate Dean/Professor, VSE (led WG-3 Centers)
Emanuel Petricoin	Univ Prof & Co-Director, Applied Proteomics & Molecular Medicine
Paul Posner	Prof & MPA Director, School Pub Policy, Government & Int'l Affairs
Tom Prohaska	Dean, College of Health & Human Services
Michele Schwietz	Associate Dean for Research, CHSS (led WG-5 Awards)
June Tangney	Professor, Clinical Psychology
Julie Zobel	Assistant Vice President, Environmental Health & Safety Office
Bethany Usher	Associate Director, Center for Teaching Excellence (student GRAs)

APPENDIX. NEW ORGANIZATIONAL CHART OF THE OFFICE OF RESEARCH AT GEORGE MASON UNIVERSITY



Section C: Research Policy, Compliance and Safety

GEORGE MASON UNIVERSITY

All University-wide policies, including research policies, are hosted on a central policy website (<http://universitypolicy.gmu.edu/>). Formal policy review and revision requirements are detailed in policy 1101. Most of the research related policies have been updated during the past 6 years due to changes in federal regulations and grant requirements that necessitate recurrent updating in the policy language and implementation. As the university continues to move in innovative research directions such as development/translational research and entrepreneurship to convert that research into licenses and companies, there may be a need to review policies to see if we are well prepared to move in this direction.

Table 1 starts with key policies followed by other University level research related policies. Table 2 contains other policies, procedures, and manuals that supplement the official University policies.

Table 1: University-wide Research Policies

Department	Policy #	Policy Name	Purpose	Last updated
4000 – Research Policies				
Primary Office: ORIA, Other Offices: OSP, Tech Transfer	4001	Financial Conflicts of Interest in University Contracts with Businesses under Virginia Law	Implements compliance with Virginia State and Local Government Conflict of Interests Act prohibiting faculty/staff involvement in contracts between the University and a business in which they have ownership. Specific waivers approvable for research and development and for commercialization of intellectual property between the University and a business in which the employee has ownership.	12/09/09
Primary Office: Tech Transfer	4002	Copyright in University Works	Describes circumstances under which the University will assert ownership of works by faculty, staff and students for which copyright protection is available; also describes the process by which works owned by the University may be commercialized, including revenue-sharing with authors in the event of successful commercialization.	2/18/2008

Department	Policy #	Policy Name	Purpose	Last updated
Primary Office: Tech Transfer	4003	Patenting University Inventions	Describes circumstances under which the University will assert ownership of patentable inventions made by faculty, staff and students; also describes the process by which University-owned inventions may be commercialized, including revenue-sharing with inventors in the event of successful commercialization.	3/19/2008
Primary Office: EHS, Other Offices: ORIA	4004	Occupational Health and Safety Program for Animal Care and Use Personnel	Describes occupational health requirements for all individuals that work with animals as part of their duties at the University.	2/17/2012
Primary Office: OSP, Other Offices: Fiscal Services	4005	Cost Transfer Policy	Describes how the University will comply with federal policies and guidelines related to the transfer of expenses to federally funded sponsored projects.	5/11/2013
Primary Office: OSP, Other Offices: EHS, ORIA, Fiscal Services	4006	Sponsored Programs Administration	Defines the Office of Sponsored Programs as the unit responsible for all research, training and service projects funded by external sources. Describes how the Office of Sponsored Programs administers the requirements for sponsored projects including pre-award, award, and post-award activities.	5/12/2015
Primary Office: ORIA, Other Offices: OSP	4007	Misconduct in Research and Scholarship	Describes how the University will manage allegations of research misconduct (falsification, fabrication, and plagiarism related to research).	2/22/2013

Department	Policy #	Policy Name	Purpose	Last updated
Primary Office: OSP, Other Offices: ORIA, EHS	4008	Private Sector and Foundation Funding to George Mason University and the George Mason University Foundation, Inc.	Describes responsible parties and practices utilized when accepting private sector and foundation funding.	4/2/2008
Primary Office: OSP, Other Offices: ORIA, Fiscal Services	4009	Subrecipient Monitoring Policy	Describes the University's responsibilities for financial and programmatic oversight of sponsored funds awarded to sub-recipients under a sponsored project awarded to Mason without regard to the primary source of funding.	1/1/2015
Primary Office: ORIA, Other Offices: OSP	4010	Financial Conflicts of Interest in Federally Funded Research	Describes the process for disclosing, reviewing, and managing potential financial conflicts of interest for all federally funded research projects.	8/24/2012
Primary Office: University Records Manager, Other Offices: OSP, ORIA, Tech Transfer	4011	Ownership and Maintenance of Research Records	The University has an obligation to maintain records related to research performed by faculty, staff, and students. This policy describes the practices for ensuring appropriate maintenance of these records.	11/20/2008
Primary Office: OSP, Other Offices: ORIA, EHS	4012	Principal Investigators	Describes the qualifications, roles, and responsibilities of Principal Investigators at the University.	9/24/2012

Department	Policy #	Policy Name	Purpose	Last updated
Primary Office: OSP Other Offices: Fiscal Services	4013	Fixed Price Agreements	Describes the administration and closeout of fixed price agreements.	2/5/2013
Primary Office: OSP, Other Offices: Fiscal Services	4015	Payroll Certification on Federally Sponsored Projects	Describes the policy and process for certifying payroll charged for individuals supported from federally sponsored projects. Payroll Certification is an alternative to the Effort Reporting process used at most institutions.	8/21/2015
Primary Office: OSP, Fiscal Services	4016	Cost Sharing	Describes circumstances and processes for the University engaging in cost sharing on sponsored projects and how those cost share commitments are documented.	2/24/2012
Primary Office: ORIA	4017	Research Involving Human Subjects	Describes the standard operating procedures and federal regulations for research with human subjects.	10/13/2014
	Other University Policies with a Significant Impact on Research			
Primary Office: ORIA	1119	Classified Information and Personnel Security Clearances	Describes circumstances in which the University will accept classified information and research and the process for personnel security clearances.	2/9/2007
Primary Office: EHS	1406	Environmental Health and Safety	Describes environmental health and safety responsibilities for the university community	2/9/2011

Department	Policy #	Policy Name	Purpose	Last updated
Primary Office: EHS	1408	Environmental Management and Sustainability System	Describes how the University will reduce or eliminate activities that negatively impact the environment, contribute to the efficiency of University operations, and conform to all applicable state and federal environmental regulations.	10/10/2012
Primary Office: OSP, Fiscal Services	2108	Direct and Indirect Cost Allocations under OMB Uniform Guidance	Describes the treatment and allocation of costs by the University to ensure consistency for financial statement and cost accounting purposes.	5/11/2015
Primary Office: OSP	2114	Reconciling Departmental and Sponsored Fund Accounting Records	Describes the need for a regular reconciliation of all University funds and organizations to departmental records in order to ensure a control structure designed to manage financial risk and maintain accountability.	6/11/2012

Table 2: Additional Research Policies, Procedures, and Manuals.

Department	Policy Name	Purpose	Notes
EHS	Art Safety Manual	Describes methods and controls for safely creating and displaying art.	The process of the creative activity of art production has safety risks since art supplies may contain hazardous materials. http://ehs.gmu.edu/wp-content/uploads/2015/03/ArtSafetyManual.pdf .
EHS	Biological Safety Manual	Describes how the University handles biological materials and provides oversight for activities involving biohazardous materials.	The manual describes the University Institutional Biosafety Committee that reviews and provides oversight for work with biohazardous materials. http://ehs.gmu.edu/wp-content/uploads/2015/03/BiosafetyManual.pdf
EHS	Biomedical Research Laboratory Biosafety Plan	Required by 42 CFR 73.12 "...Must develop and implement a written biosafety plan that is commensurate with the risk of the agent or toxin, given its intended use. The	All associated standard operating procedures, forms, and attachments contained therein. Available in Office – Shared Drive.

Department	Policy Name	Purpose	Notes
		<p>biosafety plan must contain sufficient information and documentation to describe the biosafety and containment procedures.</p>	
EHS	Biomedical Research Laboratory Incident Response Plan	<p>Required by 42 CFR 73.14. "...must develop and implement a written incident response plan based upon a site specific risk assessment. The incident response plan must be coordinated with any entity-wide plans, kept in the workplace, and</p>	<p>All associated standard operating procedures, forms, and attachments contained therein. Available in Office – Shared Drive.</p>

Department	Policy Name	Purpose	Notes
		available to employees for review."	
EHS	Biomedical Research Laboratory Security Plan	Required by 42 CFR 73.11 "...must develop and implement a written security plan. The plan must be sufficient to safeguard the select agent or toxin against unauthorized access, theft, loss, or release."	All associated standard operating procedures, forms, and attachments contained therein. Available in Office – Shared Drive.
EHS	Exposure Control Plan	Describes methods and controls for safely working with human blood, blood products, and other potentially infectious materials.	Many biomedical research processes use blood, tissues, cells, proteins, and other materials derived from humans. http://ehs.gmu.edu/wp-content/uploads/2015/03/BloodbornePathogensExposureControlProgram.pdf .

Department	Policy Name	Purpose	Notes
EHS	Laboratory Safety Manual	Describes overall implementation of and responsibilities for laboratory safety. Specifies appropriate storage, transportation, and use practices as well as emergency response.	Comprehensive 135 page manual intended for researchers to ensure awareness and implementation of various safety practices in the laboratory. http://ehs.gmu.edu/wp-content/uploads/2015/03/LaboratorySafetyManual.pdf .
EHS	Medical Surveillance Program	Describes medical evaluation and services that may be required based on a job hazard assessment.	Required by federal regulation and state code. http://ehs.gmu.edu/wp-content/uploads/2015/04/MedicalSurveillancePlan.pdf .
EHS	Chemical, Hazardous, and Universal Waste	Describes how the University handles hazardous waste including waste generated during research.	http://ehs.gmu.edu/wp-content/uploads/2015/03/ChemicalHazardousandUniversalWasteGuide.pdf .
ORIA	Standard Operating Procedure	Variety of procedures mandated by federal	http://oria.gmu.edu/1031-2/ .

Department	Policy Name	Purpose	Notes
	es for Human Subjects Research	regulations as well as developed to assist researchers .	
ORIA	Policy for the Care and Use of Animals	Describes responsibilities and policy related to animal care and use.	Updated August 2014 http://oria.gmu.edu/research-with-humans-or-animals/animal-care-and-use/iacuc-policies-and-procedures/policy-for-the-care-and-use-of-animals/ .
ORIA	Export Control Procedures	Describes procedures for implementing export controls at the University.	Enables compliance with Department of Commerce, Department of State, and Department of Treasury export restrictions. http://oria.gmu.edu/wp-content/uploads/2013/02/Sponsored-Program-Export-Control-Procedures.pdf .
OSP	F&A Cost Exception or Waiver Procedures	Describes process for reduction of F&A in certain circumstances.	http://osp.gmu.edu/wp-content/uploads/fandawaiverprocess.pdf
OSP & RC	Proposal Routing Policy	Describes process for routing proposals for funding and required information.	Significant changes in scope of projects require re-routing to ensure compliance with all sponsor and university requirements. http://osp.gmu.edu/wp-content/uploads/ProposalRoutingPolicy-June2013.pdf .
OSP & RC	Internal Deadline Policy for Proposal	Describes the Research Council policy that	Sufficient time allows for efficient allocation of resources, sufficient time to review proposal requirements, reduced risk of missed deadlines and higher quality proposals.

Department	Policy Name	Purpose	Notes
	Submission	requires proposals submitted to the Office of Sponsored Programs by four business days in advance of the sponsor's deadline.	http://osp.gmu.edu/wp-content/uploads/Internal-Deadline-Policy-for-Proposal-Submission.pdf

EHS = Environmental Health & Safety Office
 ORIA = Office of Research Integrity & Assurance
 OSP = Office of Sponsored Programs
 RC = Research Council

V. Research Innovation and Partnerships, Section A.

GEORGE MASON UNIVERSITY

A Proposal to Establish the Institute for Biomedical Innovation Executive Summary

George Mason University proposes to create the Institute for Biomedical Innovation (IBI) to jump-start biomedical research through a unique collaboration among universities, scientists, health professionals, entrepreneurs and civic leaders. Multidisciplinary teams will identify health problems, ascertain potential technological solutions and design innovative, market-friendly products that can spawn new companies, create jobs and enhance the health of citizens in Virginia and beyond.

- Placing health and market considerations at the front end of the innovation process helps guarantee that R&D yields products that are medically feasible and commercially viable.
- Mason demonstrated the success of this innovation model with its Virginia Serious Game Institute (VSGI), opened in 2014, which now hosts eight startups and employs more than 70 people.

IBI will have three pillars: innovation, incubation and infrastructure.

- **Innovation:** IBI will accelerate the research-innovation cycle through a professionally managed process that brings together academe and industry.
- **Incubation:** IBI will incubate thematic research and innovation centers that will attract investors and start-up grants for commercializing research, technologies and services.
- **Infrastructure:** IBI will offer a nurturing environment in a \$40 million, 75,000 square foot state-of-the-art biomedical center to support the design, development, prototyping and deployment of new products, ensuring the efficient use of these resources.

George Mason-- ranked in the top 200 research universities in the world and the top 100 in the United States-- is poised for advancement, with first-class facilities, expertise, and a reputation for research of consequence. Embedded in Northern Virginia's high-tech corridor near the federal government, Mason is uniquely positioned to access leading medical and health organizations, defense and security industries, and a multitude of opportunities for public and private funding.

- Mason has a strong IP portfolio, with more than 100 patents in biomedical technologies alone.
- In partnership with the National Institutes of Health, Mason has already made breakthroughs in disease detection, diagnosis, and personalized medicine.
- The IBI will enable Mason to leverage its existing research capabilities in bioengineering, surgical innovation, bioinformatics, proteomics, personalized medicine, computational science, epidemiology, modeling, simulation and public health economics and policies.

To bring the IBI to fruition, George Mason University is requesting \$4 million a year from the Commonwealth, which will be used to leverage external research grants and private venture investments.

- This investment will grow Virginia's bioscience industry. It also will strengthen and diversify Virginia's economy and support the Commonwealth's initiatives for strategic job growth and regional collaboration.

Goals and Guiding Principles

- To maximize the impact on human health through market innovation;
- To mobilize universities, healthcare providers, and business/innovation leaders to work collaboratively on research and innovation; and
- To support the Commonwealth's initiatives for strategic job growth and regional collaboration.

The mission of the Institute for Biomedical Innovation (IBI) is to discover and deploy novel solutions to improve citizen well-being, create jobs and maximize the impact on human health through market innovation. IBI takes a fresh and streamlined approach to forge a new path toward biomedical research. A specialized innovation team will mobilize scientists, technologists, health professionals, investors and business leaders to execute a design-innovation process that will (1) use their collective insights to identify target health problems, (2) envision medically feasible and commercially viable solutions, and (3) design and deploy integrated products or services for the problems. This *molecule to market* approach, driven by the diverse proficiency and guidance of key stakeholders specifically selected for each project, is the most effective way to eliminate obstacles in the innovation process and create new markets and new jobs that directly impact citizen health. IBI will form a multidisciplinary collaborative hub to help the Commonwealth leapfrog competition and move to the forefront of the evolving health and biosciences industries.

Traditional biomedical discovery follows an open-ended process of research, development and technology transfer. Oftentimes the research problem is conceived from a narrow technical perspective, leading to results that are neither human-desirable nor market-viable. Taking a human and market-centered design approach, with the key subject-specific experts and stakeholders around the same table throughout the process, IBI will create products and services that address specific problems that have been pinpointed and vetted by representatives and practitioners from groups that will benefit from the solutions. This collective co-creative process will be achieved in partnership with some of the most respected medical and health organizations in the world. Many are in proximity to George Mason's campuses in the National Capital Region.

Health(care) systems are changing rapidly, as is the way that citizens seek and use health care services through personalized/precision medicine, wearable biomedical devices and sensors, and other means of technology integration. IBI's approach will position Virginia as a leader in this future, leveraging its existing capabilities in information technology, data science, defense, and security to help to push this new frontier.

IBI's creation will **mobilize universities, healthcare providers, and business and innovation leaders in Northern Virginia to work collaboratively for research and innovation.** IBI is

designed to be an incubator for research and innovation centers. These centers provide a collaboration mechanism that nucleates regional partnerships to solve real problems while growing the economy. Through start-up grants and a performance-based growth model, the *IBI Innovation Centers* provide an excellent opportunity to pool the expertise of academic and clinical researchers, technologists, health professionals, investors, and business leaders to focus on specific areas of interest and achieve impact that no traditional academic research model allows. These centers will be formed at the intersection of multiple disciplines and will focus on cutting-edge solutions to biomedical problems in healthcare and related fields.

The IBI is created **to support strategic job growth and regional collaboration**. It will improve lives, create jobs, attract talented faculty and students, and deepen the state's commitment to biomedical research, maximizing the impact on human health. It is an organization and instrument that helps to frame complex, amorphous challenges into actionable projects. Iteratively and through collecting feedback IBI develops and moves novel products toward marketable solutions. IBI enables and invites multidisciplinary inclusion, the sweetest spot for true innovation. IBI creates a model for developing solutions available to all regional partners. IBI is at the center of an open innovation system that includes George Mason University and its key constituents statewide and in the National Capital Region.

Why George Mason University?

The largest comprehensive university in the Commonwealth, Mason is recognized by the *Academic Ranking of World Universities* in 2015 as one of the top 200 research universities in the world and among the top 100 in the U.S. Mason has focused on research of consequence – applying research to enhance human life whether through new products, technology, public policy, or improved social dynamics. Mason has a strong portfolio for intellectual property creation, with more than 100 patents in biomedical technologies alone. Mason has a proven record of success in areas such as criminology, personalized medicine, public health, and human/cyber security.

IBI is part of a strategic vision that focuses on creating multidisciplinary institutes that drive *integrated research and innovation* through collaborative partnerships. Mason has succeeded in implementing this approach to innovation and job creation in other areas. The Virginia Serious Game Institute (VSGI), for example, created an ecosystem that integrates student talents with research faculty, industry experts/mentors, and business counseling support. VSGI attracts potential investment from foundations and equity partners to launch early-stage companies into the \$80 billion simulation/game design industry. Started in 2014, VSGI currently hosts eight startups that employ more than 70 alumni, students, and interns. This new vision for technology transfer is applied throughout Mason's research and innovation enterprises, creating a collaborative epicenter of research, innovation, and entrepreneurship.

Situated in one of the most culturally and economically vibrant regions of the country, IBI will take advantage of Mason's enviable geographic location and recruit outstanding biomedical faculty, researchers, and entrepreneurs to the state. This talent influx will help to propel Mason to the next stage of growth and create a vibrant future in solution-oriented health partnerships. In turn, the state can better maximize Mason's strategic position in the region.

IBI Operational Concepts

The operational concept of the Institute for Biomedical Innovation (IBI) will have three pillars: innovation, incubation, and infrastructure.

Innovation: *IBI will accelerate the research-innovation cycle through a professionally managed process that brings together academe and industry.*

At the core of the IBI is a need-based, market-driven approach that differentiates it from traditional academic research. As depicted in Figure 1, the innovation cycle starts with a challenge-based, idea-pitching process. A professional team will engage stakeholder communities as well as an external Innovation Advisory Board to solicit, evaluate, and assess target health problems through a rigorous concept development process. This process methodically examines solutions that 1) meet a critical health need, 2) are deemed technically feasible, and 3) can be translated into products or services that are market viable. The development process iterates, through rapid prototyping and feedback loops, until a target project is identified. Next, the project enters the implementation phase; a project implementation team actively manages the development cycle while seeking/leveraging research and venture funding at various stages. The team provides project management services for IBI research and innovation centers (described below) through the process of design, development, prototyping, and deployment.

Consider an example of the IBI innovative process: Citizens and clinicians pitch significant community needs for effective testing and treatment for tick-borne diseases. The concept development team evaluates this challenge through the iterative prototyping process. At the same time, technologists, scientists, and clinicians weigh in on the feasibility of possible solutions, while representatives from the business sector determine the market viability of a product or service that could be developed, including the business model. Suppose the process converges on the development for an accurate, low-cost Lyme disease test kit, which does not currently exist. The project implementation team accelerates an iterative process of design, development, and rapid prototyping, including business model exploration for sustainability. If, however, feasibility is not proven and/or milestones are not met, the project would not continue. Such a milestone-driven, early-termination approach ensures efficient use of resources and focuses the IBI's efforts on the most promising projects. If the project continues on the path of success, the IBI team will then begin to look for external funding resources to carry forward the development process. This includes helping to develop federal grant applications, obtaining angel, venture capital, or corporate financing.

Incubation: *IBI will incubate thematic research and innovation centers that will attract investors and start-up grants for commercializing research, technologies and services.*

Creation of research and innovation centers presents a mechanism to pool the expertise of academic and clinical researchers, technologists, and medical professionals to build focused research capabilities. IBI is envisioned to be an incubator for such centers for topics such as clinical proteomics, personalized medicine, surgical innovation, and data analytics.

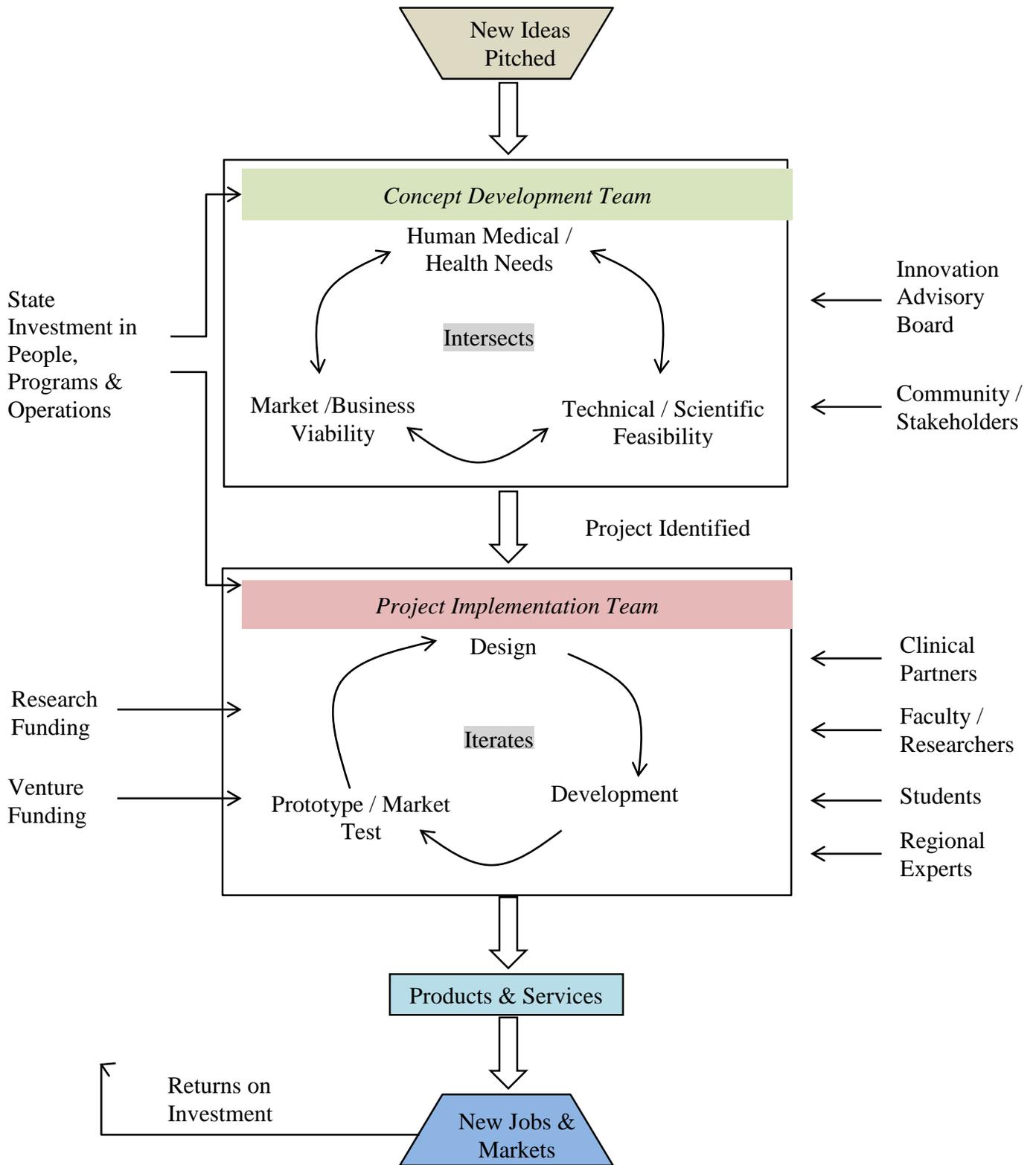


Figure 1. The IBI Innovation Process

The IBI is, by its nature, an entrepreneurial entity. Its small but versatile staff will be focused on unlocking revolutionary advances and creating disruptive technologies by providing the intellectual and physical infrastructure that supports nascent collaborations among investigators. The IBI staff will provide proposal development support and project management, as well as other necessary services such as web design, IT support, and communications management. IBI leadership will have substantial connections to scientific thought leaders and will astutely anticipate the funding focus of federal agencies. At the same time, IBI will engage representatives from the business sector to determine the market viability of a product or service that could be developed from the innovation center while seeking venture funding for commercialization.

Creation of research and innovation centers begins with the issuance of an IBI request for proposal, which will challenge teams of investigators from multiple disciplines to propose projects that are designed to address a specific area that IBI has identified as critical to public health. Once proposals are received, they will be reviewed by a panel of science and policy opinion leaders and industry experts who will choose the most promising proposal(s) for “seed” level funding – expected to be in the \$25-\$50K range annually.

Once funded, the Interdisciplinary Research Group (IRG) is formally recognized and is expected to catalyze collaboration among its diverse members. These efforts are expected to advance research ideas and incorporate innovation through the *IBI Innovation Process*. A successful IRG will secure external research and venture funding, usually within three years. External funding above a certain threshold will qualify the Interdisciplinary Research Group to be eligible for recognition as an *IBI Innovation Center (IBIIC)*. An IBIIC can expect annual funding in the \$75K-\$100K range. It is IBI’s expectation that its IBIICs will establish a culture of excellence, attract star faculty researchers, self-sufficient, and receive large, prestigious federal awards. Any IBIIC that achieves this level of funding will be recognized as an *IBI Center of Excellence (IBICE)* and will begin to receive more substantial funding from the IBI – in the \$200K - \$250K range annually. The process is depicted in Figure 2 below. We envision that IBI will incubate and grow more than a dozen Innovation Centers and one or two Centers of Excellence within five years.

In the full IBI proposal, we describe a mechanism that uses joint research and innovation centers to establish **clinical partnerships** with major medical centers.

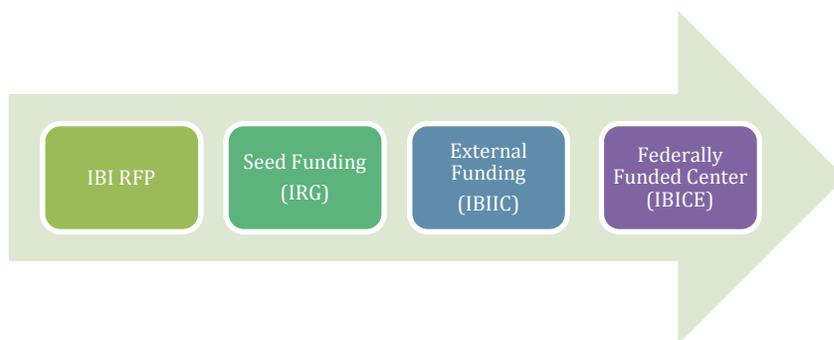


Figure 2. IBI Incubator Process for Research and Innovation Centers

Infrastructure: *IBI will offer a nurturing environment in a state-of-the-art biomedical center to support the design, development, prototyping and deployment of new products, ensuring the efficient use of these resources.*

The IBI will be started in a new \$40 million building on Mason’s Science and Technology Campus in Prince William County. This state-of-the-art building boasts 75,000 square feet of prime wet lab and collaboration space that will act as a hub of multidisciplinary investigations for Mason researchers and their academic, industry, and clinical partners. Additional physical facilities are planned in the Science and Technology campus and will be added incrementally over time. IBI will transform the superb physical infrastructure into a nurturing environment to support the design, development, prototyping and deployment of new products, ensuring the efficient use of these resources. The physical infrastructure will contain critical biomedical research instrumentation and user facilities to support cell-tissue-culture and imaging-characterization-microscopy work, multi-omic analytics, synthetic chemistry, as well as a clean room facility for micro-fabrication. The facility will be operated and sustained under a flexible and reconfigurable sharing model:

- The facility will be open to all IBI-affiliated users, centers, and clinical partners with an established recharge model.
- The wet lab facility will be assigned to research teams with funded research or innovation activities for a finite period of time. Allocation of facility resources is determined by merit review of the proposed project.
- The facility provides professionally managed resources and technical assistance to support design, development, prototyping and deployment of research/innovation outcomes.
- A formal IBI user group will be established to represent the users and facilitate the sharing of information, the formation of collaborations, and the organization of research and innovation efforts.

Request for Investment from the Commonwealth

The IBI is created to support strategic job growth and regional collaboration in biotechnology and biomedical sciences. It will improve lives, create jobs, attract talented faculty and students, and build upon the state’s commitment to biomedical research and the biosciences, maximizing the impact on human health. The IBI will launch in a \$40 million, state-of-the-art advanced biomedical research facility on the George Mason University Science and Technology Campus in Prince William County. At the opening ceremony for the facility, Gov. Terry McAuliffe said, “I applaud your decision to put your name behind this important mission: to be the top university in the top state for bioscience research.... This new institute ensures that George Mason will continue to be a powerhouse driving Virginia’s innovation economy.”

The requested investment in the IBI from the Commonwealth will transform this superb physical infrastructure into a strategic asset for health innovation in Virginia. The Commonwealth investment supports three key categories: (1) *People*: creating a dedicated biomedical innovation team, (2) *Programs*: incubating research and innovation centers that

cultivate an ecosystem of researchers, innovators, and entrepreneurs while leveraging the vast research capacity of George Mason University and its regional and clinical partners, and (3) *Operations*: operating a collaborative biomedical innovation facility that maximizes the utility of the physical infrastructure, providing advanced support and instrumentation for design, development, and rapid prototyping required for the innovation process. All Commonwealth funding will be used to leverage external research and venture investments. Specifically, we are requesting initial state funding at \$3.5 million and then at \$4 million per year in support of the following:

- **People- Key Personnel for a Specialized Innovation Team:** To implement the *IBI Innovation Process* described in above, and to preserve and reinforce its entrepreneurial culture and translational focus, IBI will assemble a specialized innovation team:
 - Director for IBI: An internationally renowned leader with deep-rooted expertise in biomedical research, and a sophisticated understanding of entrepreneurship and innovation. The director will leverage support from the business and investment communities to achieve tangible market impact.
 - Concept Development Team: Professionals with human-centered and market-driven design experience who engage stakeholders and researchers throughout the iterative design process.
 - Project Implementation Team: Professionals with project-specific domain expertise who leverage the vast research capacity of George Mason and its clinical partners and also manage progress through the life cycle of the project. Support for the personnel of each specific project team will leverage funding from research and venture investments.
 - Technical Support Team: Dedicated biomedical infrastructure and instrumentation support for researchers, clinical partners, and students.
- **Programs- Innovation Center Incubator:** As described above, under Incubation, IBI is designed to be an incubator for *Innovation Centers*. These centers provide a collaboration mechanism that nucleates regional partnerships to solve real problems while growing the economy.
- **Operations- Collaborative Biomedical Innovation Facility:** As described above, under Infrastructure, we will transform the superb physical infrastructure into a biomedical innovation and accelerator facility that serves as an integrated process for design, development, prototyping, and deployment.

To realize the bold Commonwealth vision to improve lives, create jobs, and enhance Virginia's competitiveness in the biosciences, the Commonwealth will need to leverage George Mason's strategic location and the vast capabilities of all of our research universities. Northern Virginia and the D.C. metropolitan region are dense with research and innovation entities, both public and private. Currently, Virginia is \$1 billion below the state of North Carolina in the amount of federal grant dollars awarded. Improving our competitiveness for federal dollars, seeking partnerships that advance our innovation and job creation agenda, and building our institutional research infrastructure will help us meet both institutional and state goals. George Mason University seeks support to help build this unique innovation capability through the creation of the Institute for Biomedical Innovation.

Section B: Multidisciplinary Research Seed Grant Follow Up

MDR Seed Grant Recommendations (Summer 2015)									
		Biotechnology (Bio)						Number of Proposals:	15
		Cyber and Computer (Cyber)							13
		Environment and Public Health (Environment)							15
		Society and Education (Society)							17
								Total:	60
Proposals listed in ranked order (1st-5th) by review panel category									
Panel	Proposal ID	Proposal Title	PI First	PI Last	Tier	Budget	College(s)	Comments	
Bio	15015	Engineering novel theranostic devices for cancer treatment using an integrative experimental and simulation approach	Carolina	Salvador-Morales	2	\$ 25,000	VSE, COS, VCU	Submitted as a Tier 1	
Bio	15011	Stop osteoarthritis by blocking both arms of the inflammatory cycle with a novel inhibitor	Alessandra	Luchini	1	\$ 50,000	COS, VSE		
						\$ 75,000			
Cyber	15026	Pilot Testing a Graphic Text Messaging Intervention to Encourage Smoking Cessation Among First-Generation Chinese and Korean Immigrant Men in the Metropolitan DC Area	Xiaoquan	Zhao	1	\$ 50,000	CHSS, CHHS, VSE		
Cyber	15028	Effects of intensive task-specific training in patients with spinal cord injury: from physiology to function	Siddhartha	Sikdar	1	\$ 50,000	VSE, CHHS		
Cyber	15024	Health Narratives: A Multidisciplinary Approach to Understanding Health-Related Information Generation and Dissemination in Social Media	Anthony	Stefanidis	1	\$ 50,000	COS, CHHS, Krasnow, CHSS	Pre-CSS move to COS	
Cyber	15023	Engineering networked tracking devices for smart medical and emergency response training	Nathalia	Bannan	1	\$ 50,000	VSE, CEHD, CHSS		
Cyber	15020	Assessing Mobile Health Technologies for Medication Compliance and Nutrition Tracking for Possible Use by Kidney Transplant Candidates	Naozu	Koizumi	2	\$ 25,000	SPGIA, VSE, CHHS		
						\$ 225,000			
Environment	15040	Impacts of the 2011 MIPPA Bundled Payment System on ESRD Care Provision: A Patient Outcome Comparison between Hemodialysis and Peritoneal Dialysis Modalities	Naozu	Koizumi	1	\$ 50,000	VSE, SPGIA, CHHS		
Environment	15036	Vaccine preventable disease outbreaks and community level vaccination coverage	Paul	Delamater	2	\$ 25,000	COS, CHHS		
Environment	15037	What facets of socioeconomic inequality and neighborhood-level segregation are associated with consumer behavior, diet quality, and obesity?	Cara	Frankenfeld	2	\$ 25,000	CHHS, COS		
						\$ 100,000			
Society	15051	Use of Technology to Manage Stimulus Cues and Reduce Drug Relapse: A STEAM-H (Science, Technology, Engineering, Arts & Math - Health) Initiative	Holly	Matto	1	\$ 50,000	CHHS, COS, CVPA		
Society	15056	The Mason Undergraduate Nutrition for Campus Health (MUNCH) Research Project	Margaret	Slavin	2	\$ 25,000	CHHS, CHSS		
Society	15057	A Multidisciplinary Approach to Mitigating Campus Sexual Assault	Bonnie	Stabile	2	\$ 25,000	SPGIA, S-CAR, COS, CHSS, CHHS		
Society	15052	The 100th Meridian Project: Exploring Contemporary Water Issues in Historical Perspective	Rick	Davis	2	\$ 25,000	CVPA, COS, CHSS		
						\$ 125,000			
						Total:	\$ 525,000		