Report of the Top-Tier Research University Thematic Team
March 2014

Introduction and Vision

The Campus Vision statement speaks directly to University of Wisconsin-Milwaukee's institutional research aspirations and frames the report of the Top Tier research University Thematic Team:

> "We will be a top-tier research university that is the best place to learn and work for students, faculty and staff, and that is a leading driver for sustainable prosperity. We will accomplish this through a commitment to excellence, powerful ideas, community and global engagement, and collaborative partnerships."

A top-tier public research university has several characteristic attributes: (1) it generates scholarly outcomes that are recognized with the research community; (2) the university graduates highly skilled individuals at all levels, including research and practice-based doctoral degrees; (3) the research generates discoveries that result in patents and startups; and (4) the university has a positive impact on the region through community and business partnerships.

The focus of our top-tier vision is research excellence. Research can be defined as the creation of new knowledge and/or the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies, inventions and understandings[1]. This includes application, synthesis and analysis of prior research in new and creative ways. This broad definition encompasses creative work across our disciplines, and engages faculty, staff and students. From this perspective, research excellence is an overarching goal that must permeate the institution. The focus should on developing areas of excellence in key areas of existing and emerging research strengths, in both disciplinary and interdisciplinary[2] domains. This is linked to creating a culture that embraces creativity and innovation among faculty, staff and students. This will be promoted by linking our research to our broader community through community engagement and collaborations. Within the university, there is a need to invest in developing a top-tier research infrastructure that supports research across our disciplines and throughout researchers' careers. Finally, it will be essential to continue to assemble and retain the best team of top researchers and students.

This research vision is interrelated to many aspects of the broader strategic planning effort, as illustrated by a few of the close linkages with student success and internationalization themes.

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[1] Modified from the Australian Research Council (2012) report *Excellence in Research for Australia 2012*.

[2] The Committee on Facilitating Interdisciplinary Research, Committee on Science, Engineering, and Public Policy (2004) report *Facilitating interdisciplinary research* provides a useful definition: "Interdisciplinary research is a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice."

To implement this at all levels would require expanding the range of meaningful research experiences into our curriculum from lower-level classes through graduate courses. These experiences would engage students in the discovery experience, establish research within our educational culture, and attract curious and innovative students. A reputation for research excellence attracts high-quality undergraduate and graduate students from Wisconsin and USA, thereby improving UWM's position for recruiting international students who help diversify the experiences of all our students. Research projects and relations also provide opportunities for developing international experiences for domestic students.

This report outlines a pathway to research excellence and recommends steps along this pathway. The recommendations are based on the Campus Vision that UWM will be a top-tier research university (Figure 1) based on identifying several outcomes that are the hallmark of such institutions. The common important actions are grouped within four basic objectives (related to critical research areas, teams, infrastructure and outreach/engagement). The recommended actions address the research climate/culture at UWM, the interrelation of research and education, the needed financial investments, and the conduct of institutional operations. The proposed role for UWM and its success is critical to the economic competitiveness and sustainable prosperity of southeastern Wisconsin.
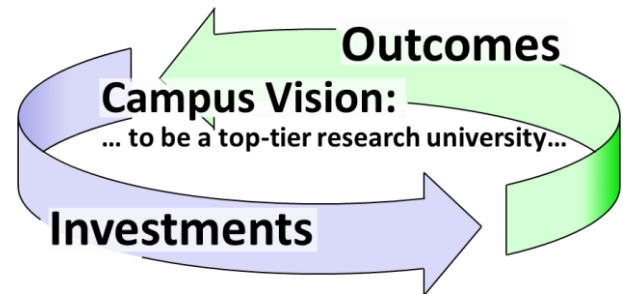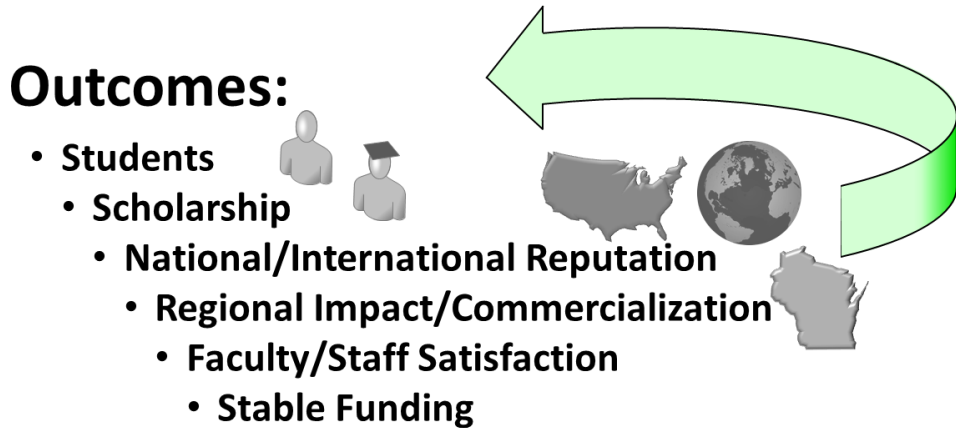

Making the Vision Tangible

This institutional vision will require changing the perspectives of faculty, staff and students in terms of expectations, practices and assessments. This will take consultation and incentives to work and a focus on research outcomes that characterize research universities (Figure 2).

The desired research outcomes provide tangible goals and lead to usable metrics/indicators that can be used to track the institution's progress. These can be grouped into six major clusters each of which has clear metrics (Table 1):
- Scholarly Outputs
  Scholarly outputs include products that are traditionally recognized in research rankings (articles, books) and those that reflect the outcomes of a broad scholastic based research university (exhibits, performances).
- Successful Students
  Students are a major product of academic institutions, and we focus on outcomes that reflect the research experiences and careers of our graduates.
- National/international Impact
  Our impact can be measured through the involvement and recognition of our researchers at a national and international level.
- Regional Impact and Commercialization
  On a more regional level, our researchers contribute by direct engagement with the community and through collaborations with business partners.
- Faculty and Staff Satisfaction

Critical to any research university is the recruitment and retention of faculty, scientists, and staff. We need to expand this population to achieve critical masses in key research areas while improving the infrastructure to support research activity across our disciplines throughout the researchers' careers.

- Stable funding
Funding is an important input to many research activities. We need to include external support in both traditional research and outreach/service since different disciplines receive support in each area.

Outcomes:
- **Students**
  - **Scholarship**
    - **National/International Reputation**
      - **Regional Impact/Commercialization**
        - **Faculty/Staff Satisfaction**
          - **Stable Funding**

Table 1

Outcome	Possible Metrics
Scholarly Outputs	Number of articles, book chapters, books, conference publications, exhibits, live performances, recorded work, and original creative works; their citation and referencing.
Successful Students	Number of PhD's granted, thesis masters; placement of PhD graduates; percentage of undergraduates involved in research; percentage of undergraduates who graduate and who enter doctoral programs; student diversity
National/ International Impact	Number of members of national academies and statutory committees; editors of prestigious reference works; achievement awards and presidents of national and international societies; prestigious honors
Regional Impact and Commercialization	Number of patents, registered designs, licenses, startup companies, authors of international/national/state guidelines, alumni in leadership positions; percentage or number of alumni employed by regional firms; funding from industry or commercial partners
Faculty and Staff Satisfaction	Number of faculty, post-docs and research staff; retention of faculty and research staff; funding for high-performance computing, library acquisitions and major equipment purchasing/upgrades; annual survey of researchers on campus business functions (travel, HR, purchasing); faculty and staff diversity
Stable Funding	Expenditures from federal sources and total external sources for both research and service/outreach activities; state research funding

The outcomes and related metrics provide an outcome for tracking the university's progress toward research excellence. The metric clusters can be combined to express the campus performance in these six domains. These measures can also be used to frame the profile of research excellence at a unit-level that reflects the discipline and that can be compared to appropriate aspirational peers. (The team plans to investigate these topics in coming months.)

These outcomes present a tangible suite of top-tier research characteristics that encompass a broad range of activities and help frame recommendations for moving toward top-tier research status.

At a broader level, these outcomes are tightly interwoven with the objectives of the other strategic planning teams. Top-tier research universities graduate successful students at all levels, attract diverse faculty and students from around the world, and engage their local/regional community and partners. Other necessary components are the appropriate physical environment, technology, and a supportive working climate. All of these are the focus of other teams, but components appear in our recommendations because all are critical for a research university.

The use of the outcome-oriented approach is recommended to compare UWM's profile to other top-tier research universities. Some outcomes are readily linked since evaluations of research and doctoral programs incorporate metrics related to institutional characteristics beyond those listed above. Some examples of this alignment are: undergraduate graduation rates, post-graduation placements, gender/race/ethnic diversity of faculty and students, number of international students. The articulation of outcomes and associated metrics will allow us to compare our performance to other aspirational research peers as a central feature of the campus strategic plan.

How to Reach the Vision

The team identified underlying strategies for developing research at UWM that helped inform its recommendations. A key approach is to build on our current strengths to form critical masses of researchers in chosen research areas of excellence. Interdisciplinary research should be emphasized due to the opportunities for creativity and innovation. Other urban public universities have successfully used this approach to expand their research profile.

This approach also leads to some basic cross-institutional strategies. We need to assemble strong research teams, establish structures for sustained interdisciplinary research, and build an infrastructure that provides support across careers and disciplines. To pursue research with regional and commercialization impact, we need to establish long-term partnerships with community and business collaborators.

Another facet of the research focus is to articulate expectations for faculty, staff and students. This extends into the design of our degree programs at all levels - including incorporating meaningful research experiences into our undergraduate programs – and a campus culture that promotes and celebrates research success. Finally, funds used to support this vision must be viewed as investments toward desired outcomes and should be assessed accordingly.

The team identified a wide range of actions, changes to policies and practices and financial investments that would improve research at UWM (Appendix 1).

Implementation has been prioritized for some of these as critical actions for our research development that need implementation over the next 3-5 years. Here, they are presented in the context of four major objectives (see appendix 2 for a summary). These objectives cut across the research outcomes and strategies identified above. In a broad sense, these represent investments of time, effort and funding that seek to move UWM along the pathway to top-tier research status (Figure 3).

Investments:

- **Themes**
- **Teams**
- **Infrastructure**
- **Outreach & Engagement**
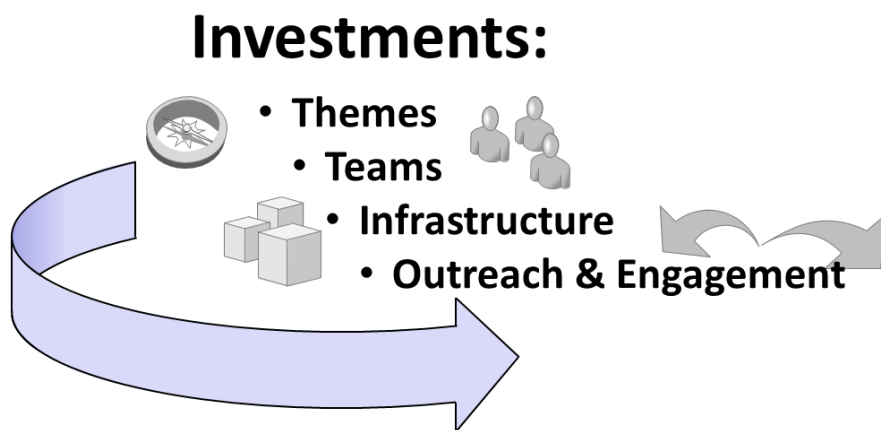
Objective 1: Focus on critical research themes

1. Implement department/unit-level on-going research planning

   The goal of the current planning effort is to guide the use of campus resources toward scholarly outcomes that are valuable to the university. One primary goal is to identify areas of existing and emerging research excellence, to articulate how to promote these areas, to assess their alignment with external support, and to inform decisions on using our resources to support these areas.

   The research planning process will connect department and unit plans with broader campus goals and serve as roadmaps for development of units. Department level research plans must identify areas of existing or potential research excellence, and how these impact future hiring and program development. Even more critically, the disciplinary planning process must also identify opportunities for interdisciplinary research areas in which the university can excel. Crosscutting research themes have not been fully developed (or adequately supported) at UWM, so the planning process must be structured to support these initiatives that build on disciplinary excellence. This is a policy and implementation issue that will help guide development of our research profile.

2. Support interdisciplinary research focus groups

The University needs to develop a culture that fosters interdisciplinary research. In part this will occur through programs and spaces that address this idea. However, to be more successful, it will be critical to have researchers interact and explore areas of common interest. We recommend supporting the development of "research focus groups" – informal, interdisciplinary groups of researchers who share their research, discuss new developments in their disciplines, and provide diverse perspectives within a research theme. Ideally these focus groups would include researchers with diverse disciplinary perspectives (for example, UWM focal groups include neurosciences and digital humanities). The intent is that these interactions could lead to new research projects and educational programs. We envision a multifaceted (and relatively low cost) incentive program to develop these groups.

3. Establish and invest in research clusters/centers

The University needs to invest in developing strong research clusters/centers in areas of existing and emerging excellence. This will be critical for developing disciplinary and interdisciplinary research areas of excellence with substantial scholarly impact. The identification and creation of areas of excellence should align with existing resources and strengths, critical external opportunities and needs, as well as extramural funding priorities.

Recommendation:
Establish a "Research Center Growth Program" to invest funds over a limited term to develop sustainable centers, initiatives and research clusters that will be able to thrive after the initial investment period. This program should be open to both established and new interdisciplinary centers. Proposals must present a research plan that identifies clear and measurable scholarly outcomes, and a budget plan that includes sustainability after the award period. It will be critical to use external evaluations of leading proposals, and to conduct post-funding reviews. Funding should be substantial (~$500k/yr), for a limited term (3-5 years), and result in a sustained enhancement in a center's activity and visibility. If two centers were selected each year, this initiative's cost would ramp up to about $4M/year.

Objective 2: Assemble the best research teams

1. Increase number of faculty and researchers

The number of faculty at UWM has fluctuated between 674 FTE (2000-02) and 838 FTE (2012) over the last fifteen years. We anticipate that the University will need more faculty members to grow its new schools and programs, and to create the research groups/clusters in critical areas. The team recommends increasing the faculty and research scientists to 950-1000 within five years. This will be needed to provide innovative learning opportunities within current and new programs, and to build the critical mass of investigators around new research themes. The estimated cost is $18M, although moving some salary costs for non-permanent researchers onto grants could offset this.

Recommended Actions:
- Hire an additional 100 faculty and 50 scientists/researchers.

- Target some faculty hires of established researchers who enter at the associate or full professor level and also provide leadership in key initiatives.
- Adopt a visiting professor or scientist model that facilitates rapid hiring of researchers into 4-5 year limited term positions.
- Implement the "Research Professor" model for appointing outstanding researchers who do not desire a faculty appointment.
- Increase the number of endowed chairs to attract outstanding faculty.

2. Increase compensation for faculty and staff

UWM's compensation for faculty and staff is well behind our urban and aspirational peers, in part because of limited salary increases over the last four bienniums. This seriously threatens the University's ability to retain outstanding faculty and staff. To be most effective, compensation needs to be linked to merit including outstanding contributions for both research and teaching. This is essential to retaining our most productive faculty. The increase in base funding needed to bring salaries to national norms is about $12M. To address this need, the University will need to work with UW-System and state government to improve compensation on a system-wide basis.

Recommendation:
- Increase the base funding needed to bring salaries to national norms with an investment of about $12M.
- Establish a merit based salary compensation plan for outstanding contributors.

3. Establish more flexible workload policies

Faculty work is a combination of research, teaching and service activities. The balance between these activities may vary during a faculty member's career, and they may overlap as in the critical area of mentoring undergraduate and graduate students in their development as researchers. We need to value and reward these varied contributions. At any given time, a faculty member's assignment should be reflective of the scholarly outcomes important to the individual faculty member, their unit, and the University. This can only be addressed within the context of individual schools and colleges because of their different objectives and needs. Implementation of this recommendation will need discussion between faculty and various levels of administration.

Recommendation:
- Establish more flexible workload policies that value and reward the varied contributions of faculty and that contribute to research outcomes at all levels in the University.

4. Clarify expectations for faculty within the context of their discipline

Departments need to establish clear expectations for faculty by requiring department-level promotion and tenure criteria. These criteria should support the strategic goals of the department and the University, and reflect the scholarly outcomes valued by the discipline.

These policies exist for about one-third to one-half of our units but should be developed for all units. The process of creating these policies can be very useful in articulating a unit-level vision of research excellence. Faculty and deans can readily implement this recommendation.

Recommendation:
- Establish clear expectations for faculty by requiring department-level promotion and tenure criteria that reflect the research aspirations of the University and the contribution by each department to this vision.

5. Increase compensation for graduate assistants

The Provost requested a study of graduate assistantship compensation from an ad hoc working group. That study was submitted to the Provost in October 2012. The study group recommended a compensation system that would position UWM to compete for high-quality graduate students. The estimated cost of implementing a competitive compensation system is $3M/yr over the current Chancellor Fellowship and Research Excellence programs. The structure allows for compensation differentials that reflect the disciplinary differences and the need for fellowship supplements across all areas.

Faculty members have identified this as one of the top issues for our research success. We strongly endorse addressing compensation for graduate student assistants with a system that can sustain competitive stipends. The graduate fellowship stipends must be adjusted to meet or exceed the assistantship rates.

Recommendation:
- Address compensation for graduate student assistants and fellows with a system that can sustain competitive stipends.

6. Examine the structure of our doctoral programs

The goal of doctoral education is to train and graduate highly qualified researchers in their respective domains of knowledge. The pathway toward this goal may vary between disciplines or for individual students. Some doctoral students are research-ready (due to past experiences) as they enter our programs while others require more preparation. However many of our doctoral programs are perceived to be structured around two years of coursework that culminate in a preliminary exam (some explicitly forbid research prior to that benchmark), followed by two (or more) years of research. Dissertators are capped at three credits per semester, forcing coursework to be compressed into the first part of their program.

Students should pursue their research work as early as possible in their program to develop a strong research portfolio by the completion of their degree. Programs should examine their program structure and expectations with this goal in mind. We should consider options such as having no specific course requirements beyond the master's level to encourage customized

programs that challenge graduate students to learn what is needed to be successful in their field.

Recommendation:
- Programs should examine their program structure and expectations to allow students to pursue their research work as early as possible in their program to develop a strong research portfolio by the completion of their degree.

7. Use undergraduate research and combined degree programs to attract and retain high-quality undergraduate and graduate students

Undergraduate research and combined degree programs can be used to feed high-quality students into our graduate programs. Undergraduate research is supported by both campus programs and individual faculty (through grants for summer research experiences or within traditional research grants). These experiences strengthen students' research skills and their interest in research at UWM. Expansion of these programs will engage good students with our research community.

A second approach is to expand the number of combined degree programs. Programs that combine bachelor and masters degree (or masters and doctoral degrees) help students complete both degrees in timely manner and allow us to attract good students. These programs can also be used to attract students from other institutions – for example, the School of Freshwater Sciences is discussing an agreement under which a master's degree at a UW-System comprehensive university could be linked to a PhD at UWM.

Another strategy is to develop joint and dual graduate degrees with other institutions. This approach is currently under discussion to build academic partnerships with both local (Medical College of Wisconsin) and international (Ningbo University) institutions. These agreements facilitate the recruitment of high-quality graduate students and new research collaborations, while providing our students more educational options.

Both combined degrees and joint degree were identified as initiatives in several of the school/college academic plans, and the Graduate School indicated strong support for developing these programs. Their development should be made a priority and can be accommodated with current UWM structures.

Recommendation:
- Use undergraduate research and combined degree programs to attract and retain high-quality undergraduate and graduate students

Objective 3: Develop a top-tier research infrastructure A – Research Support Systems

Creating and sustaining a top-tier research infrastructure requires a significant base-line operational support (OSP, compliance, facilities), considerable on-going investment (internal support programs, facility/equipment upgrades), and the ability to provide incentives to units

and individuals for research success (funds for research travel, grant matches, space renovation, adding support staff, raising faculty salaries, etc.). One key will be to link the incentive funding to research supports for productive faculty, research projects and units. Funding streams for these varied activities must be identified and recognized as critical to the institution's research activity. Indirect cost returns cannot cover all these costs as research grows - they probably suffice to cover the incentives.

1. Clearly identify resources used to support base needs, to fund incentives, and to provide an award structure that stimulates productive research.
   The existing budget structure is not conducive to achieving the institutional aim of a top tier research University. The lack of clearly directed and allocated funds and controls to achieve this aim must be a key part of the underlying strategy that demonstrates both the commitment and priority for this objective.
   Beyond the base allocations there should be allocations for incentives and a clear reward structure to stimulate productive research outcomes.
   Recommendation
   - Establish clear budgetary commitments and controls to provide the resources needed for top-tier research programs.

2. Invest in more robust data systems and meaningful metrics

   The university will need more robust data systems to support its research efforts to evaluate its research performance and investment of funds. This will require clear and quantifiable data on our scholarly outcomes, as well as our resource usage. Campus has started along this path by adopting (however inconsistently) the "Digital Measures" tool for reporting annual summaries of faculty productivity, and is currently looking at making the system more "user friendly". Campus has also started to use a space management program "InSite" to track and quantify the costs and benefits of space usage.

   It is stressed that the need for such measures to track institutional performance, provide a framework for assessment of research investments, and for units to evaluate their standing within their disciplines is a key part of moving to the top tier status.

   Recommendations
   - Invest in developing and adopting modern data systems and meaningful research metrics.
   - Adopt a suite of metrics that capture UWM's performance across the desired research outcomes (see above). The suggested metrics require more study and campus discussion.

3. Centralize statistical and survey support

   Statistical and survey work are essential components of research in many social science and community studies. These services were provided through multiple venues spread throughout the University, including some long-standing centers (CUIR, ISPR). These groups did not necessarily work in a coordinated way, and some expertise is duplicated. Recent growth of biomedical-related research has also led to an increasing need within some natural science disciplines for similar support.

Recommendation:
- Create a centralized body to provide statistical and survey support across various disciplines. The idea is to identify the different types of support functions and structure the new unit to reflect those needs. The new unit would be a "single shop" service provider that could be used by all faculty and researchers. The unit should be responsible to the Provost for delivering these key services.

4. Research Centers as Foci for Interdisciplinary Research

A recent review of research centers and institutes has set out clear guidelines for their operations and review. As part of the research strategy this is required to be formally adopted. While this is sufficient for existing centers, the focus on interdisciplinary research and innovative research directions requires financial support and an ability to strengthen the adoption and uptake of these both prior to and during the growth phase of these centers. One example is with the appointment of research fellows and the freeing up of faculty to participate fully in such centers and research activities.

Recommendations:
- A Research Center Growth Program is needed to fund selected centers to grow their scholarly activity. The estimated costs ramp up to about $4M/yr.
- Expand research fellowship programs for faculty fellows, akin to those within interdisciplinary research centers (e.g., Center for 21st Century Studies, Global Studies in CIE), to support both disciplinary and interdisciplinary research. Ten new fellowships with sufficient buyout and discretionary funds would cost about $200,000/yr.

5. Internal UWM research support programs

There are a number of campus-level programs that support research activity throughout a faculty member's and graduate student's career at UWM. These internal support programs are the University's research investments in specific research programs and projects. Awards provided through these programs must be directed toward specific outcomes (publications, funding, presentations) that align with the University's objective of becoming a premier research institution. These programs should include assessment mechanisms of the outcomes.

Specific programs that should be considered for expansion or introduction are listed below (including the equipment acquisition and center development programs noted above). Fully implemented, these require approximately $6.3 M/yr, as compared to the current allocation of about $4.7 M.

- Research Growth Initiative awards are linked to an expectation of seeking external funded. This program uses external review and requests can be of any size. Currently $3.5M; could be increased to $4M based on the number of highly rated proposals in recent rounds.

- Faculty Research and Creative Activities Support (FRACAS) awards are smaller awards (capped at $15k) to faculty without expectations of specific financial returns. They are used by faculty to initiate low-cost research activities. Currently $300k/yr; could be increased to $500k/yr with broader faculty participation.
- Faculty Travel Awards provide funds for presenting research results and currently limited to Arts and Humanities. Currently $50k/yr; could be expanded to $200-250k/yr and expanded to all faculty.
- Graduate Student Travel Awards fund students to present the results of their work at conferences, art venues, etc. Currently $100k/yr; could be expanded to $200-250k/yr to assure support of all students to one presentation.
- The Office of Undergraduate Research currently awards $750k/yr to students for research with faculty members. This program should be expanded and supplemented with programs to engage entering freshmen and to support lower-division course-based research opportunities. The cost of expanding these programs to engage a broad range of students is $550k/yr.

6. Increase research support staff

One critical need as our research profile expands will be research support staff for proposal development and grant administration support. This should include three groups of staff:
- Decentralized post-award support within units without experience in grant accounting to support investigators in the administration (personnel and budget) of extramural awards. We estimate that an additional 6-8 FTE are needed across campus.
- Expansion of the proposal development office to align faculty and scientists with opportunities, and to assist in developing proposals. (2 FTE)
- Technical staff in centralized equipment cores who can maintain the equipment and provide instruction in its use. We estimate about 6 FTE in addition to existing staff.

Recommendations:
- Expand research support staff for grant administration post award.
- Expand support staff for proposal development and opportunity identification.
- Appoint technical staff in centralized equipment cores who can maintain the equipment and provide instruction in its use.

7. Streamline policies and procedures

The most critical areas of concern for researchers are purchasing, travel, human resources, and data security systems. Some result from existing policies and related procedures, others are simply historical processes that are not relevant for research oriented activities. They lead to frustration, irritation and disincentivization of researchers and their support staff.

Recommendations:
- Establish an on-going working group with members from the Office of Research, the Research Policy and Advisory Committee, and the Division of Administrative Affairs to review and streamline policy and related procedures.
- Monitor the results with an annual "Best Place for Research" survey of researchers.

8. Articulate and develop the role of the Office of Research

The potential benefits for research stimulation created by splitting off of the Office of Research from the Graduate School need to be developed. The Office of Research must provide leadership for UWM's research efforts, and needs authority to direct research investments, provide oversight of research centers, and act as a campus-wide facilitator for interdisciplinary work.

Recommendations
- Establishment of a research advisory board with both internal and external representation to work with the Vice Provost to oversight research direction.
- Strengthen the role of the Office of Research to direct investments, to oversight research centers and to promote interdisciplinary research.

Objective 3: Develop a top-tier research infrastructure B – Equipment & Information Systems

1. Equipment

The cost of acquiring, updating and replacing research equipment continues to increase in many disciplines. The current equipment array was largely purchased using startup funds and external (major equipment) grants. This approach does not allow UWM to keep up with current needs, because startup funds only cover acquisition costs and external grants target "cutting edge" equipment development. Moreover, the lifetime of a typical startup instrument is shorter than the duration of a faculty career, requiring mid-career retooling to remain scholarly active and competitive.

A coordinated approach to major equipment purchases and maintenance would allow the research community to make full use of UWM's equipment array. We have few shared facilities, in part because faculty members who purchase equipment with startup funds have a (justifiable) sense of ownership for that equipment. There are some successful shared facilities (such as the SEM/TEM lab in Lapham and the AAF in EMS) but these are few. Shared facilities should be developed to support technical support staff to maintain the facilities.

Recommendations:
- Campus needs to establish an annual program to update and replace research equipment. The process should include submission of proposals for external funding, and make use of the resulting reviews in evaluating proposed purchases of major equipment. This will require about $1M per year of central funding with unit matches, deploying the mechanisms developed through a pilot program in 2012/13. This may be supportable with campus indirect funds as our research funding increases.
- Existing facilities and future major equipment acquisitions should be reviewed for inclusion as shared facilities with support for their operations. This should be linked

to a user fee structure for maintaining and updating the equipment. Establishment of a "pay for use" scheme to cover depreciation, base operational costs (including staff) would assist funding of future maintenance and replacement costs.

2. Facility development

The development of research facilities requires advanced planning and coordination with research plans. Two major challenges are clear. First, major remodeling projects or construction of new space takes multiple bienniums of planning, approvals, design and construction. Historically facility development has lagged behind our research needs because the hiring of faculty can occur more quickly. Second, research spaces have been generally conceptualized and built as customized labs with little flexibility. Allocation of space in these areas requires uniform policies and procedures to ensure that occupation policy is consistent with the designated use of the space.

To address these concerns, we offer three recommendations:
- Facility needs of new or growing initiatives (including new research clusters) be identified as part of the research planning process. These facility needs should be incorporated to space development to have the spaces available when they are needed.
- Research spaces need to be flexible so that they can accommodate different users over time, and to allow space assigned to projects to expand (and contract) to reflect their needs.
- Construct "research commons" spaces for interdisciplinary research work that provides space for different types of research space (wet labs, dry labs, project space, etc.). This model should be used for new or renovated buildings on both the Kenwood and Wauwatosa campuses. The space should be assigned for research projects on a limited-term basis. Projects should be selected based upon a campus-wide competitive selection process. The facilities should be managed by the Vice Provost for Research, not a specific school or college.

3. Invest in Library resources

UWM's scholarly activity depends heavily upon Library and information resources, and these resources are increasingly in digital formats. This remains a challenge in face of limited resources. UWM currently spends $3.4 M/yr on acquisitions (books, journals, online access) from a variety of sources. (Of this only $2.9 M is from state operating funds.) The average expenditure in 2013-14 among similar and aspirational peer institutions (Great City Universities, urban public research institutions) is $6.6 M/yr. We also note that the Library has initiated an effort to develop an open access repository of UWM research products (the "Digital Commons").

Two recommendations:
- The institution needs to increase the Library acquisition budget over several years to reach the $6.6 M level. Acquisitions should include expanded online journal access and building base collections in areas of new and expanding research activity.

- UWM¹s Digital Commons needs to be fully implemented and utilized for archiving and sharing scholarly output, including but not limited to books (monographs), articles, journal publications, images, and video and audio ephemera. As increasing amount of research is stored, the need to have support for archiving and curating scholarship will continue to grow. The implementation costs are approximately $100k (one-time) with on-going costs of about $80k/yr.

4. Invest in IT resources

UWM's scholarly work is increasingly reliant upon information systems and technology. These systems need to include the ability to store, manage and analyze very large data sets; enhanced visualization capabilities in both research and teaching; systems to manage research data; and support distance collaborations.

A measure of a top tier research university is its access to or ownership of high or very high performance computing and computing support facilities – this is essential for almost all disciplines and certainly to attract new faculty.

The IT Thematic Team is providing recommendations on improving this infrastructure (and the associated costs). Three specific actions that align with and support their recommendations are:
- The campus needs a detailed plan on improving the research IT infrastructure at UWM that addresses the campus-wide development needs.
- Establish a research-computing group that can implement the research-computing plan in a coordinated and efficient manner. This will require a high level of integration with academic units to be effective.
- Establish the capacity for large-scale data storage (in parallel with establishing data curation expertise in the Library) so that research data can be saved and make accessible to other researchers in ways that are consistent with approved data management plans.

Objective 4: Link to our community through outreach and engagement

1. Support for external, including international, collaborations

Many faculty members work with research collaborators outside the UWM. The University's research and educational activities are involving increasing numbers of external collaborators that include businesses, community, government and university partners that can be local or anywhere in the world. The research interests of our faculty will increasingly lead to business-sponsored research as federal funding declines and should be an important component even if this later increases. Research strategies within Schools and Colleges and at departmental level are increasingly looking to industry for supplementary funding at times as completely new research initiatives.

Some of these relationships (for example with Johnson Controls, IUCRC and the Water Council members) have given UWM a high profile with State and Federal funding agencies

and engendered further support from industry and business. As it is a non-traditional source of funding the mechanisms for facilitating and maintaining industry liaison are poorly developed. Often there are federal and state funds to support and provide leverage for these linkages and research outputs. There should be specific research faculty needs identified to fill these roles that are beyond traditional faculty roles. This is dealt with in Section 2 with research professor positions.

The issues of working with industry and the potential conflicts of interest, maintenance of academic independence and protection of intellectual property are being raised more frequently by faculty. The OSP and UWM-RF structure has served well to protect the university to date. However as these interactions increase, to re-assure faculty who work or plan to work in these areas it is proposed that guidelines for these are developed to ensure transparency and accountability.

The researchers who are leading these initiatives require support to develop new projects and to maintain and service existing relationships. Accordingly the role of 'development officer' within these units that are working with industry should be considered to broaden and to encompass the dual role of seeking philanthropic gifts and development of new industry funding initiatives.

Our academic program and research collaborations are leading us to new academic arrangements (such as dual and joint degrees) and shared facilities. Taken together, these changes will require UWM to be more nimble and responsive to working with partners in both research and educational domains.

Our internal support for these collaborations largely resides in the Office of Research, the Graduate School, the Center for International Education (CIE), the UWM Research Foundation (UWM-RF), and the office of the Vice Chancellor for Development. Two issues emerge from our current practices. First, the support structures for working with business and international partners are scattered among different parts of the University. It can be confusing to navigate through this array when initiatives involve multiple units at UWM. Second, we need to initiate more collaborations with external partners to provide more research and educational opportunities.

Five actions are recommended:
- Develop transparent processes to facilitate working with business partners that are clearly communicated with the faculty.
- Establish new liaison roles for development of industry linkages, funding and research programs within Schools and Colleges.
- Review, clarify and streamline the processes for research and program collaborations with international partners.
- Initiate more international contacts by hosting international and national symposiums in targeted research areas.
- Support initiatives with other educational institutions that integrate education and research activities (IGERT for example) to increase the impact and visibility of our research activities.

2. Publicize the university's research successes to external audiences

Researchers have expressed frustration that their research outcomes are not more visible in national and international media. They have indicated examples where their colleagues at other Universities have received this media exposure while their own recognition has only come belatedly, only in local media or sometimes not at all. This undervalues the research, the researchers and reputation of the University.

Such action requires researchers and Schools and Colleges to identify such successes early and communicate these to University Relations. This must become part of our 'excellence in research' culture.

UWM needs to provide more visibility for its research contributions. Some specific actions and recommendations are:
- Establish a position within University Relations for rapid communication of our scholarship to the broader community.
- Initiate parallel communication efforts at the school/college level.
- Hold an annual "Research Showcase" for both internal and external audiences.

3. The University needs to celebrate scholarly successes.

The University needs to present its research successes and their benefits to the local, statewide and broader community. In the same time, it is important to have internal recognition for research successes. We recommend a few steps to address these issues:
- Establish a campus-level Chancellor's speaker series with UWM faculty and scientists who are nationally/internationally known speakers and who bridge disciplines.
- Provide more recognition for successful scholars across campus. Two current examples are the Graduate School/UWM Foundation Research Awards, and the annual recognition event for faculty who publish books. We recommend that we find additional ways to publicize and celebrate the accomplishments of faculty, researchers and graduate students within our campus community.
- Encourage "Research Excellence" recognition programs within Schools and Colleges that are linked to incentives (S&E funds, course release).

Recommendations, outcomes and investments

The recommendations (summarized in appendix 2) are a mixture of actions that will require substantial investments over the next several years; some require substantial funding while others involve changing policy and practices. The goal is to move UWM to become a top-tier research university (Figure 4), or in terms of the Carnegie classification, we want to change UWM's current description of doctoral "research university with high level of research (RU/H)" into a "research university with **<u>very</u>** high level of research (RU/VH)". The design of the recommendations is to make the institutional changes that will lead improved research outcomes

and increased visibility for the University. This will help UWM become a destination campus for both top researchers and students. We anticipate that these research-related investments will increase our students' success and increase our impact on the region.
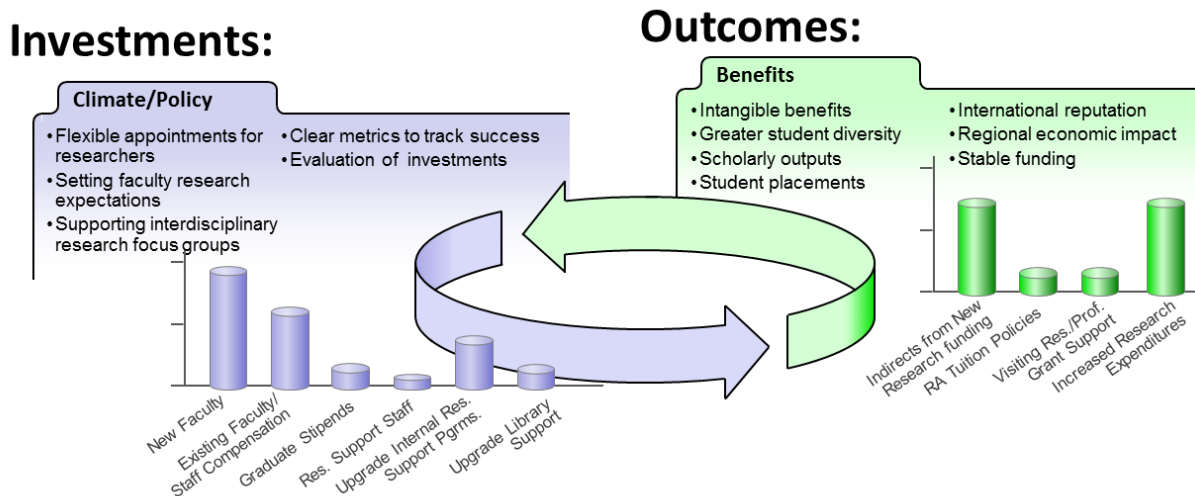
The highest priority financial investments and their estimated annual costs aver current levels are:

Increase the number of faculty and scientists	$18 M
Increase faculty and staff compensation	$12 M
Increase graduate stipends to competitive levels	$3 M
Increase the research support staff	$1.2 M
Upgrade internal research support programs	$7.5 M
Upgrading library support	$3.3 M

These priorities total $45 M. To these, we must add the costs of upgrading the IT infrastructure to current standards (see the IT team report). About $15 M could be obtained by increased indirect costs revenue ($10 M), consistent RA tuition policies ($1-2 M), and partial funding visiting professors-researchers and research professors salaries through grant funding ($3 M).

This leaves about a further $30M to be found for investment. Over the 5-year period this amounts to about $6M per annum. With increased revenues from professional masters programs, PhD and international students in higher degree enrolments ($2M increasing to $8M pa) this appears to be feasible within the broad budget strategies. Commitment to the strategy thus requires an integrated and coordinated implementation since all aspects are closely intertwined. A detailed budget investment strategy is required for implementation.

Further the realization of this research vision is dependent upon the strong support of all of the other thematic teams participating in this planning process. That is, achieving TTRU status depends upon attracting and retaining a widely recognized faculty and first rate staff (Human Capital; Access, Diversity, Inclusion Thematic Teams). In turn, faculty and staff will affiliate with a university that recruits and sustains a high performing student body independently of

financial status (Successful students, Financially Sustained University) and works tirelessly to insure that qualified under-represented students find great opportunity at UWM (Access, Diversity, Inclusion). Faculty, staff, and students depend on a highly functional physical plant (Physical Aspects), cutting edge technology (Technology). With all of these elements in place, exciting, creative academic planning can take place (Academic Planning) that includes increasing focus on global understanding (Internationalization). Out of this milieu, knowledge-based community engagement thrives (Community engagement) and graduating students move into their careers with the high-end skills needed to contribute to physically and economically sustainable communities (Sustainable Prosperity). As described, the relationship between top-tier research university status and all of the other themes is bi-directional. Just as top-tier research university status requires the support of the other themes, it provides powerful tools for these themes as well.

Many of the other recommendations focus on changing UWM's culture to be research-oriented. These include setting clear research expectations for faculty, building a strong research support staff, supporting interdisciplinary research focus groups, and bringing research into all our programs so all our students' benefit. Perhaps the most notable recommendation is to use groups of clearly identified metrics to track our overall progress, how units compare to their peers, and the outcomes of our research investments. The institution must become more deliberative about our choices to make progress toward the six research outcomes articulated in this report: (1) Increased scholarly outputs, (2) Successful students, (3) Expanded impact at the national/international level, (4) Significant regional impact and commercialization, (5) Increased faculty and staff satisfaction, and (6) Establishment of a stable level of research funding

This vision ties into many aspects of the strategic planning effort. Research universities attract a wide and diverse range of faculty, staff and students. These institutions are engaged in the cultural and economic well-being of their communities. Most importantly, top-tier research universities engage their students in the academic careers, and motive them to succeed.

Appendix 1: Full list of possible actions aligned to objectives

	Action	Policy or Process Change?	Estimated Financial Cost
Objective 1: Identify and Invest in Key Existing and Emerging Research Themes/Areas of Excellence			
1	Develop, Implement, and update university/department/program level research plan	x	
2	Seed funding for developing "focused research groups"		$75 k
3	Investment program for center development		$4-5 M
4	Regular review of research centers	x	$20 k
Objective 2: Assemble the Best Researchers and Teams			
1	Increase number of faculty from 850 to 950		$12 M salary
2	Increase number of scientists/researchers to 50		$6 M salary
3	Increase faculty compensation to level of aspirational peers		~ $12 M salary
4	Process for workload adjustments for research (at department and campus levels)	x	?
5	Course release model at department and campus level	x	?
6	Department-level P/T expectations	x	
7	Revise rules on hiring Visiting Researchers (up to 5 yrs)	x	
8	Develop succession plan for leadership of research centers	x	
9	Adopt the "Research Professor" model	x	
10	Develop, Implement, and update university/department/program level research plan	x	
11	Increase staff compensation to level of aspirational peers		?
12	Establish career ladder	x	
13	Expand professional development training		?
14	Revise staff positions to be more flexible	x	
15	Revise grad assistantship model to peers		$3 M
16	Funding to recruit outstanding students		
17	Establish combined undergrad-grad degree programs	x	
18	Involve faculty in undergrad advising at an early stage	x	
19	Revise PhD programs to be research-driven from first yr	x	
20	Clearly separate independent study vs undergrad research	x	
21	Increase undergraduate thesis programs (Honors model?)		?
22	Increase funding for undergraduate research		? $250 k
23	Use graduate students as mentors		?
Objective 3: Develop a Top-Tier Research Infrastructure/Support Network			
1	Increase number of research administration staff, including both distributed staff and central pool of research administrators (8-10 FTE)		$600-800 k

2	Identify "Go To" contact person for Research Project administration and in Administrative Affairs units (HR, Travel, Purchasing)	x	
3	Implement core facility model for major equipment	x	
4	Hire staff for core equipment facilities (~ 6 FTE)		$550 k
5	Space for undergraduate research		?
6	Flexible spaces for internal and external research collaborations		?
7	Bring basic resources (holdings, online access) to those of peer institutions		$3.3 M
8	Develop library as hub for data management services (data management, archiving) in collaboration with IT		?
9	Develop open access data repository		$80 k
10	Develop process for a data-based assessment of the impact of our research		?
11	Develop research IT support office		See IT team
12	Adopt a rational and sustainable IT support model		See IT team
13	Provide IT support over the life cycle of a project and the career of an investigator		See IT team
14	Have appropriately scaled IT infrastructure (desktop to cloud computing) available		See IT team
15	Research Growth Initiative to $4M		$800 k
16	FRACAS to $500k		$200 k
17	Faculty travel awards to $250k		$200 k
18	Graduate Student travel awards to $250k		$150 k
19	Increase funding of undergraduate research experiences to $1.3M		$550 k
20	Increase graduate fellowships to 2% of students (~90)		$1.7 M
21	Major equipment acquisition/upgrade program		$1 M
20	Establish a methodological/survey unit		?
21	Clearly identify base, investment and incentive funds	x	
22	Set aside investment funds for priority items		as selected
23	Use indirects as incentive funds	x	
24	Use funds toward specific quantifiable outcomes	x	
25	Schedule uses of funds based on priorities and availability	x	
26	Assess use of budget against metrics, desired outcomes	x	
27	Establish a Research Commons in a central location		?
28	Flexible, re-assignable research spaces for projects, groups, student work	x	As spaces developed
29	Use "discovery/inquiry" in some labs, including introductory undergrad level	x	
30	Create "immersive GER" clusters	x	
31	Increase courses on interdisciplinary topics	x	

32	Development series for research (RCR, Occup Safety, research design, etc.) for undergrads, grads, post-docs)	x	
33	Support for subventions, open access publication		?
34	Hire for core research and collaborations	x	
35	Increase numbers of research talks		? $50 k
36	Nominate faculty and staff for major honors	x	
37	Support for student applications for major fellowships		$50k
38	Form advisory group to Vice Provost for Research	x	
Objective 4: Link Our Research with our Community			
1	System for "match making" UWM researchers to opportunities	x	
2	Continued development of support through UWM-RF	x	
3	University Relations position for communication and marketing of our research		? $75k
4	Use physical and digital environments to showcase research	x	
5	Research showcases		?
6	Support for hosting speakers/visitors and conference		$50-100 k
7	Expand current programs that support entrepreneurial work		?
8	Involve both undergrads and grads in entrepreneurial projects	x	
9	Expand industry/UWM-RF involvement in entrepreneurial projects	x	
10	Establish an office modeled on Whitewater's experience		?
11	Publicize success internally and externally	x	

Appendix 2: Key Action Areas

Objective 1: Focus on critical research themes

1. Initiate a department/unit-level research planning effort
2. Support interdisciplinary research focus groups
3. Establish a Research Center Growth Program ($4M/year)

Objective 2: Assemble the best research teams

1. Increase number of faculty and researchers to 950-1000
   - Hire 100 faculty and 50 scientists/researchers within five years ($17M)
   - Adopt a visiting professor/scientist for 3-5 year appointments
   - Implement a "Research Professor" model
   - Increase the number of endowed chairs
2. Increase compensation for faculty and staff ($12M)
3. Establish more flexible workload policies
4. Clarify expectations for faculty within the context of their discipline
5. Increase compensation for graduate assistants ($3M)
6. Examine the structure of our doctoral programs
7. Attract and retain high-quality undergraduate and graduate students
   - Expand undergraduate research opportunities
   - Expand number of combined bachelor and masters programs
   - Develop joint or dual degrees with other institutions

Objective 3: Develop a top-tier research infrastructure

1. Clearly identify resources used to support base needs, to fund incentives, and to provide incentives
2. Invest in more robust data systems and meaningful metrics
3. Facility development
   - Facility needs of new or growing initiatives (including new research clusters) be identified as part of the research planning process and incorporated into space development planning.
   - Build flexible research spaces.
   - Construct a "research commons" building for interdisciplinary research work.
4. Invest in Library resources
   - Increase the Library's annual acquisition budget by $3M.
   - Fully implement UWM's Digital Commons. The costs are $100k (one-time) with on-going costs of about $80k/yr.
5. Invest in IT resources
   - The new CIO should work with campus units and external consultants to develop a detailed plan on improving UWM's research IT infrastructure.
   - Establish a research-computing group to implement the research computing plan.
   - Establish the capacity for large-scale data storage.
6. Centralize statistical and survey support into a "single shop" service provider

7. Equipment
- Implement a Major Equipment Replacement and Acquisition program at the level of $1M/yr
- Place major equipment purchases in shared facilities.
- Establish user fee structures for maintaining and updating the equipment.

8. Internal UWM research support programs
- Increase the Research Growth Initiative program $3.5M/yr to $4M/yr.
- Increase the "Research Committee Awards" program from $300k/yr to $500k/yr with broader faculty participation.
- Increase Faculty Travel Award program from $50k/yr to $200-250k/yr and expanded it to include all faculty.
- Increase Graduate Student Travel Award program from $100k/yr to $200-250k/yr to assure support of all students.
- Increase funding for Undergraduate Research awards from $750k/yr to $1.3M to engage a broad range of students.
- Increase the research fellowship programs for faculty within interdisciplinary research centers by adding ten new fellowships ($200k/yr).

9. Increase research support staff
- Decentralized post-award support (6-8 new FTE)
- Expansion of the proposal development office (2 new FTE)
- Technical staff in centralized equipment cores (6 new FTE)

10. Streamline policies and procedures
- Establish an on-going working group to review and streamline policy
- Monitor the results with an annual "Best Place for Research" survey

11. Articulate and develop the role of the Office of Research
- Clarify authority within UWM
- Establish a research advisory board to work with the Vice Provost

Objective 4: Link to our community through outreach and engagement

1. Support for external collaborations
- Develop transparent processes to facilitate working with business
- Review, clarify and streamline the processes for research and program collaborations with international partners.
- Initiate more international contacts by hosting international and national symposiums in targeted research areas.
- Support initiatives with other educational institutions that integrate education and research activities (IGERT for example).

2. Publicize the university's research successes to external audiences
- Establish a position within University Relations for communicating our scholarship to the broader community.
- Initiate parallel communication efforts at the school/college level.
- Hold an annual "Research Showcase" for both internal and external audiences.

3. The University needs to celebrate scholarly successes.
- Establish a campus-level Chancellor's speaker series
- Provide more recognition for successful scholars across campus
- Encourage "Research Excellence" recognition programs

Appendix 3: Committee history and membership

The Top-Tier Research Thematic Team was initiated in Spring 2013, and met for the first time at the March 13, 2013 Strategic Planning Kickoff Meeting. The team met regularly over the next year (45 meetings). In addition, the team conducted three listening sessions in May 2013 for research staff, associate and assistant deans involved in research, and members of faculty and staff governance groups (including invitations to all members of the Research Policy Committee), and led a two-day August retreat on the theme of "Organizing Academic Planning around Research Excellence".

The members of the team are:
- Ewa Barczyk, UWM Libraries
- David Crass, Research Cyber Infrastructure
- Jackie Fredrick, Blood Center of Wisconsin
- Marija Gajdardziska-Josifovska, Physics and Graduate School
- David Garman (co-chair), School of Freshwater Sciences
- Prasenjit Guptasarma, Physics and Research Policy Committee
- Mark Harris (co-chair), Geosciences and Office of Research
- Hemant Jain, Business
- Katherine Kober, Office of Research
- Michael Liston, Philosophy and Graduate School/Office of Research
- David Petering, Chemistry
- Nigel Rothfels, Office of Undergraduate Research
- Mark Schwartz, Geography and University Committee
- Brian Thompson, UWM Research Foundation
- Cindy Walker, Educational Psychology
- Merry Wiesner-Hanks, History
- Mary Ann Wright, Johnson Controls