Report of Table 6
Discovery and Innovation: Research
Vision 2010

Introduction

The University of Ottawa has achieved excellence in a number of research areas, has succeeded in creating a culture of research participation, and has both a solid core of high-calibre researchers and momentum upon which it can build.

Continuing to nurture, grow and sustain world-class research and pursuing research excellence demands foresight and planning. We believe this planning must be guided by two key principles - first, we will achieve the best results if we can optimize the alignment of personal and institutional goals and, second, our planning must be centered on our people: our professors, our students, our postdoctoral fellows and our technical and support staff. As such, we have proposed a number of approaches aimed at achieving a strong consensus on our future directions and on strategies for setting and achieving our goals. We have considered a number of factors that could help or hinder a researcher's ability and motivation to conduct her or his research. We have sought to fully include our hospital-based research institutes, important members of our research community, in our reflection.

Our current situation

The University of Ottawa, in partnership with its affiliated hospital-based research institutes, now conducts well over $150 million in research annually. We have experienced rapid growth in recent years. Several of our multi-faculty and multi-disciplinary institutes are showing success, which suggests not only a relative lack of "silo building" among our research groups, but also an openness to and skill in these types of collaborations. Our hospitals are extremely important partners, and recent growth has been driven in large part by medical research, a key part of which is now conducted and managed in our affiliated hospitals. Our *Strategic Areas of Development* are providing a focus around which investments can be made and teams can be built.

Yet, we face challenges. Though we have had significant successes in all disciplines and in such interdisciplinary and multi-institutional programs as the federal Networks of Centres of Excellence program, our national ranking at NSERC is lower than at SSHRC or CIHR, suggesting there is opportunity for development in these disciplines. Also, despite our growth, our national rankings at the granting councils have not changed significantly over the last few years relative to other universities, which implies we are "running harder to stand still" when compared with our competitors.

Quality and focus of research

1) Should we focus or should we allow excellence to emerge?

We believe that research excellence can be achieved and maintained only through concerted efforts in areas in which we have, or can create, sustainable advantages. This will require that we establish our priority areas, set goals, develop strategies for reaching these goals and measure our progress.

Over time, we must acquire the organizational abilities both to identify and anticipate emerging areas in which we can take leadership and to design and implement strategies to respond to these opportunities.

Departments, faculties and institutes are uniquely positioned to assess their current and emerging strengths, as well as their areas of research need and opportunity; and our researchers are the best people to identify important research issues and areas. Yet, we learned that many faculties and most departments do not have a strategic research plan. Faculties, departments, institutes and centers, should therefore be required to craft strategic research plans that identify priority areas and define how they intend to intensify their research in such areas. It is through units' self-assessment and planning that major research foci and themes will emerge. As a starting point, all should consider opportunities to align themselves with our current *Strategic Areas of Development* which, as discussed below, will continue to evolve, taking into account the units' own priorities.

Centrally, our senior research management team must assume the role of creating and articulating the University's research vision, which, in turn, must be integrated into the University's overall Mission Statement. Building on the themes emerging from the departments, faculties and institutes, new opportunities for the evolution of our *Strategic Areas of Development* will arise. Central management must share the responsibility of identifying interdisciplinary opportunities, catalyzing the formation of multi-investigator teams, spotting opportunities to create synergies between areas of existing and emerging strengths, and providing mechanisms by which opportunities can be acted upon.

As a comprehensive, bilingual university, we recognize that our undergraduate programs are at the very foundation of our institution and require a broad base of expertise across a range of disciplines. This is often a fundamental consideration in a department's or a faculty's recruitment plans. Research merits equal consideration in faculty and departmental recruitment plans. This is especially important now because, with many retirements projected in the coming years, there will be a special opportunity to recruit into strategically important research areas. Consequently, departments and faculties should explore whether or not future recruitment programs can focus on current and emerging research priorities, while assuring the breadth of expertise needed to support undergraduate programs. For example, faculties and departments should ask themselves whether or not a faculty member's undergraduate teaching is necessarily limited to that person's area of specialization. If not, then this would create greater flexibility to hire into strategic research areas from which natural teams, groupings and graduate programs could be created.

We must, wherever possible, coordinate our strategic research-plan development with those of our hospital-based partners. Where relevant, all should be encouraged to explore collaborative opportunities with scientists in hospital-based research institutes, who should also be encouraged to seek opportunities to work with their university-based colleagues.

We should consider creating a senior research advisory group mandated to advise our senior management team on the definition of our *Strategic Areas of Development*, to identify emerging needs and opportunities, to consider how we fit into the national and international research environment, and to help define important areas in which we can build sustainable research programs that will permit us to truly excel, and to create mechanisms to promote interdisciplinary work.

2) Strategic areas of development (SADs)

We believe that the SADs provide an essential vehicle to define research areas in which we can truly excel. We are a dynamic organization working in a rapidly changing environment. Consequently, as good management practice, our SADs should be reviewed regularly on a roughly five-year cycle. Clearly, they must now be reviewed as part of Vision 2010.

We do not envision major changes to our SADs, because our efforts and investments to date must be allowed to develop and grow and because we are already seeing signs of success. However, some re-consideration is now appropriate. On the one hand, the SADs are broadly stated so that much can be included in their definitions. On the other hand, some faculty members are feeling excluded from the current set of SADs. There has been criticism that important areas, such as the environment, have been neglected or improperly categorized. Some members of our community have suggested there should be an increased focus on globalization and that there is much we can learn from and contribute to a global, knowledge-based, society. Indeed, as a bicultural and bilingual university, we can offer truly unique perspectives in this regard.

3) Measuring research productivity and quality

We should target being the best in our areas of priority rather than targeting an overall increase in research rankings. In a comprehensive university such as ours, research excellence in our priority areas will enhance our reputation, promote a broader-based culture of research excellence, and open up opportunities for new projects and programs and for increased research funding. We must also target success at competitive, peer-reviewed agencies in our priority areas.

We recognize that measurement processes can be disruptive, labour-intensive and de-motivating, especially if the results of such measurements have direct or indirect resource-allocation implications. The challenges seem to lie a) in recognizing that different disciplines have different criteria and expectations for dissemination, quantity, quality, etc., b) in developing objective and relevant criteria for various disciplines, and c) in ensuring that we assess ourselves accurately against comparable organizations. Procedures must be lightweight to keep paperwork to a minimum.

As part of the faculty/department strategic planning process outlined above, each unit should define relevant criteria by which they would measure success, including success at peer-reviewed funding agencies (as discussed below). Specific goals, consistent with our objectives of achieving excellence, should be defined. Ongoing measurement should be tied in to developmental strategies and be used to assess success, to set directions, to identify opportunities, and to implement remedial measures where necessary.

One extremely important measure will be our peer-reviewed rankings and our success at peer-reviewed funding agencies. These are verifiable and provide a widely accepted “gold standard” indicator of quality as measured through peer-review processes (despite their weaknesses). Peer-reviewed programs also inherently reflect the voice of the research community in identifying important research issues and setting priorities. Success in these programs can also provide an ongoing indicator of the relevance of our work. Setting growth and success targets at the peer-reviewed agencies, both broadly and within our priority areas, also aligns well with several other important university objectives because success in such programs benefits our reputation, which in

turn benefits our professors, our students and PDFs and our ability to raise funds; it also provides basic support on which other projects and programs can be developed and funded; finally, it increases resources allocated to the University of Ottawa from a variety of programs, including those of the SSHRC (Institutional Grant), the Canada Research Chairs, the Canada Foundation for Innovation, and the federal Indirect Costs Program.

Benchmarking our research status against other relevant universities and in relevant granting council programs should start immediately. Faculties and departments will need this information for their planning processes.

4) Basic vs. applied research

Clearly, granting councils and funding agencies now tend to target some research funding towards mission-specific or strategic research programs. Our university must consider and respond to such external needs. The alternative is to be perceived as an elite ivory tower organization, unresponsive to our sponsors' and to society's objectives. This could jeopardize our ability to reach our research objectives.

We must also recognize that much of our research work is exploratory and "basic" and that this is a critical role of universities in our society. This must be sustained and supported. Participation and success in peer-reviewed granting agencies will afford us the continuing opportunity to conduct this research and should therefore continue to be an important aspect of our objectives for the future.

Often, but not exclusively, "applied" research is done through research contracts with a variety of government and private-sector sponsors. Research contracts, which are regularly negotiated, can and do protect our academic interests while allowing excellent research projects to be conducted. Such projects help us build expertise in areas that we can, in turn, develop to attract peer-reviewed funding, to provide interesting research opportunities for students, and to forge strong and productive relationships with external partners. Ottawa offers unique opportunities in this regard because it is the seat of the Canadian government and, as home to a dynamic high-tech business community, is one of Canada's hubs for industrial research investment.

We do not find the "Basic vs. Applied" research dichotomy helpful. Much excellent, peer-reviewed research, is conducted at both ends of this so-called spectrum. To be a community of ideas and of learning, we must respect and value true excellence regardless of the nature of the work. Each researcher should therefore seek to balance "basic" and "applied" research, and grant or contract funding, consistent with his or her own interests. However, all research should meet the "excellence" criterion, as assessed through recognized criteria and through peer review. Where criteria are not available, we ought to develop them ourselves.

5) Commercialization and knowledge transfer

A university is a creator, a communicator and a guardian of knowledge. In the knowledge era "the educational opportunities offered by the university, the knowledge it creates, and the services it provides are key to almost every priority of contemporary society, from personal prosperity and

well being to economic competitiveness to national security to protecting the environment to enriching our culture." [1]

There is a clear societal expectation that universities be involved in "knowledge transfer": from lab to bedside in health disciplines; from university to commercial developer in many science, engineering, and health disciplines; and this is increasingly so in some social sciences and humanities disciplines, for the benefit of policy and decision makers. Commercialization, namely the transfer and application of our research results to create commercially available goods and services, is now favored and funded by federal and provincial governments. The challenge is to define how we can promote knowledge transfer in all disciplines in a transparent and accountable way, but without diluting or diverting scarce resources from other research and educational priorities.

It is vital that our university maintain a broadly based commercialization and knowledge-transfer capability. The incentive cannot be a purely financial one, as "profitability" can take a long time to develop and may depend on a tiny number of highly successful technologies. Rather, the incentive should be a sense of duty to our societal sponsors and a responsiveness to the members of our university community who, on an individual level, see an opportunity or wish to respond to broader societal objectives.

Of course, an active knowledge transfer or commercialization project can consume huge amounts of a professor's time and can be demanding of the University's limited resources. Yet, the nature of our research work and the knowledge-transfer opportunities thus created are such that the process cannot be initiated or brought to fruition without the professor's active involvement. Similarly, housing of start-up companies, although often justifiable on a case-by-case basis, requires allocation of space (a truly scarce resource) and other infrastructure (such as computing, communications and laboratory support services) and carries a big risk of "mission drift" for the University.

The critical issues we see are:

- How can we ensure that this investment does not result in "mission drift" or otherwise detract from our fundamental research and teaching objectives?

- What is the appropriate level of internal investment, financial and other, for these activities?

- How can we support our scientists in these processes? Can we seek the help of our local community to provide entrepreneurship expertise and business-mentoring skills? Can we find ways to enhance the availability of professors for knowledge- and technology-transfer activities or to use their time more effectively?

- How can we work with our community to create mechanisms that will increase the chances of success for our knowledge- and technology-transfer activities? For example, can we create mechanisms and settings for nascent companies to locate in and, hopefully, to prosper?

- How can we be accountable and transparent in our commercialization activities?

---

[1] Duderstadt, James J., 2000, A University for the 21st Century, The University of Michigan Press

These issues require a broader discussion both on campus and with our external partners. We therefore suggest that a workshop be held to discuss these issues and to formulate recommendations; a variety of stakeholders would be invited.

Summary of key recommendations - Quality and focus of research

1. Faculties and departments should be required to develop Strategic Research Plans that

    - Assess our current status with respect to peer-reviewed funding agencies and compared with other relevant universities;
    - Set priority research areas and their alignment with the University's objectives and *Strategic Areas of Development*;
    - Include faculty recruitment plans addressing both research and teaching needs;
    - Define goals and progress- measurement criteria;
    - Establish priorities and plans for supporting graduate student recruitment and for providing students and PDFs with a supportive research environment.

2. A process under the aegis of the Vice- Rector, Research, should be initiated to review and update our *Strategic Areas of Development.* This process should be consultative, iterative and interactive with the faculty and departmental planning process recommended above.

3. A workshop should be organized very soon by the Vice- Rector, Research, with internal and external stakeholders, to consider the issues related to knowledge transfer and commercialization, and to formulate suggestions and recommendations on the appropriate level of investment in such activities, on strategies to increase local community involvement, and on facilitating the process from a researcher's perspective.

4. A research advisory group should be created and given the mandate to advise our senior management team on identifying opportunities and implementing strategies for research development.

Reward system

Our ability to do research and to excel depends on our people. What's more, excellent research meshes intrinsically and inescapably with the quality of our teaching programs, supports a vibrant and relevant learning experience for our students and plays a key role in our ability to attract and retain the best graduate students and professors. University researchers should be actively involved in both teaching and research. One challenge to the promotion of research, therefore, is establishing mechanisms to encourage and reward research participation and success, while maintaining a manageable workload for researchers. We must also ask ourselves whether the time has come to consider the development of alternative scholarly career paths, perhaps with some having a lesser emphasis on research and thus allowing individuals to contribute in a way best suited to their abilities and interests while still being perceived and rewarded as important players in the University's overall mission.

1) Workloads

The single greatest professorial responsibility that affects availability to do research is teaching. Experience shows that tension between teaching and research increases as research intensity increases. With the rapid growth in recent years of both research intensity and student populations, we are not immune to such tensions. Hence, a strategy to bolster research has to consider workloads in general and teaching workloads in particular.

Many appear to think that the generally increased emphasis on research and the creation of research chairs, institutes and centers have reduced teaching loads for some professors, thus prompting a redistribution of teaching workload among others. Although we believe some positions with a greater (but not exclusive) emphasis on research are important and needed, we must be concerned if such emphasis is creating inequities in workloads. If true, malaise in faculties and departments will be quick to appear. However, little reliable data is available to support or negate this perception.

It is therefore critically important to develop a better understanding of our actual teaching workloads and to compare them with those of other relevant organizations. A committee, under the aegis of the Vice-Rector, Academic, should be struck to systematically establish workloads across faculties and departments and to benchmark the University of Ottawa against other relevant organizations. The benchmark data will help us not only determine whether the workload and expectations of professors have become too high and too open-ended but also design knowledge-based strategies to assure the availability of professors to do research.

Because teaching places significant demands on professors' time, we must explore ways of optimizing the use of professors' time and of making teaching more efficient (while maintaining academic standards) to free up time for research. For example, research suggests there is an optimum to be reached for teaching and assessment that assures the best learning experience for the student. We must also work to facilitate teaching and to enhance the student's experience with new learning technologies.

2) Career paths and development

People's aspirations and talents differ. That said, maximum impact, including in the development of our research activities, will come from aligning personal, departmental and University goals. These goals must encompass all of the activities of a comprehensive and research-intensive university. With a growing emphasis on research on our campuses and the perception that research success has become a critical criterion for promotion and success, we must ask whether traditional academic career paths still support our goals.

As a university, we must expect a certain level of scholarly engagement from each professor. It will be important to provide career paths that respect and reward scholarly work of different kinds in research, education and teaching, and in the administration and management of the scholarly enterprise(2). Scholarly work, as opposed to other kinds of professional activities, must not only

(2) One faculty, the Faculty of Medicine, launched a task force to consider this issue, which issued a report titled "Valuing our Future" in 2001[2]. This section draws heavily from that report, which is available at http://www.medicine.uottawa.ca/pdf/task_force.pdf.

involve a high level of expertise and innovation, but also be innovative, publicly available, open for peer-review and critique, and subject to replication and development [3]. Recognizing the importance and value of different kinds of scholarly work, and ensuring that such work is afforded appropriate rewards and opportunities for promotion, would allow people to devote their skills and talents to projects and activities for which they are the most motivated. This in turn would help improve the alignment between personal and corporate goals.

Faculties and departments, where appropriate, should therefore be encouraged to chart and articulate scholarly career paths that provide for career progression in such areas as research, education and teaching, and administration and management, including a statement of what is expected for each path and what is required to implement such an approach in their respective settings and contexts. We would also have to consider how performance expectations can be established and measured, what kind of professional development systems would be needed, and what kind of transitional programs would be needed to practically enable periodic shifts from one path to another. Similarly, this approach should be extended to other technical and support staff, very important contributors to our research endeavors, with particular consideration given to the issue of job security.

Summary of key recommendations - Reward system

5. A committee should be struck, under the aegis of Vice-Rector, Academic, to systematically identify teaching workloads across all faculties and to compare University of Ottawa workloads to those of other relevant universities. Particular attention should be paid to professors starting their university careers.

6. Where appropriate, faculties and departments should be encouraged to chart and articulate scholarly career paths, including a statement of what is expected for each path and what is required to implement such an approach in their respective settings and contexts.

Creating a stimulating research environment

1) Environment

Our research environment is more than our buildings, our laboratories and the equipment they contain. We must also consider the human component: as departments, faculties and institutes develop research foci, they also build teams and research groups. These groups will interact among themselves, with other groups and with the community at large. Creating places and opportunities for people to interact and making a conscious effort to reach out to our communities must be seen as important and enriching. Informal meeting places that prompt socialization and mentorship will be needed, as will mechanisms to assure greater cross-pollination and interaction with our communities.

[3] "Valuing our Future"

2) Young professors

In an era of intense recruitment and changing expectations, young professors hold the key to our future success. It is vital that the University provide the support that young professors need to start forcefully in their drive to build long-term success in research.

a) Mentorship and other resources

New researchers often go from being members to leaders of a research team. They are often inexperienced in dealing with the complexities of grant applications to competitive research funding programs and in working with large bureaucracies. It is important that we provide early support at this critical time and that we trumpet the importance of research in our university.

We recommend that all new professors have a designated mentor who can help them adapt to their new environment. The mentor would be a more senior, like-minded colleague working in a related area. We may wish to consider linking Tier 2 Canada Research Chairs to our current Tier 1 Chairs as a catalyst for synergies as well as mentorship and coaching opportunities.

Faculties should design guides for writing grant applications and should implement internal grant-review processes, to ensure that new applicants get the best possible advice as they formulate their first proposals.

A "Research Guide for New Researchers" should be produced immediately to convey a range of key information such as whom to see about what, imminent and upcoming deadlines, and resources available.

b) Teaching relief

The first year is a critical time for new researchers as they launch their research programs. They must be granted some teaching relief during this period to allow them to focus their energies in this direction. However, young professors, who often enjoy such relief, worry that they will not be able to keep up when they start to take on a full teaching load. This can be quite dispiriting. As such, we reiterate the importance of carefully analyzing our workloads and benchmarking them in relation to those of other comparable organizations.

c) Start-up funds and infrastructure

Sufficient seed funding should be made available to new researchers to enable them to initiate their programs and achieve the results they need to rapidly become competitive in external funding programs and especially in peer-reviewed systems. This is a shared responsibility of faculties and the Central Administration.

3) Interdisciplinarity

We view research "interdisciplinarity" as the gathering of researchers from different disciplines to investigate matters of common interest, thus bringing to bear different intellectual perspectives and traditions to the issue at hand. If we are to be, and to be *perceived* as, a well-respected contributor in

the resolution of society's issues and concerns, then our ability to promote and conduct interdisciplinary research will be a critical factor in our success and competitiveness as a research-intensive university, because the issues are complex and require the know-how and perspectives of many disciplines. This requires both strong disciplinary expertise as well as a framework and infrastructure within which interdisciplinary work can readily take place.

Building on the report titled "Interdisciplinarity for the University of Ottawa" by Dr. Susan Mann in collaboration with Le Groupe de travail sur l'interdisciplinarité, we have made significant progress in many areas: research institutes and centers have become the motors of interdisciplinarity on our campus, investments have been made in interdisciplinary programs and prizes, and new multi-disciplinary academic programs are emerging. Yet, a number of practical problems and barriers remain, and they must now be addressed.

Interdisciplinary institutes, centers and programs can be perceived as sapping resources from departments, particularly if teaching resources are diverted. Other contentious issues include credit and recognition for teaching outside one's faculty, how research grants and awards are recognized at institutes and faculties, and how resources linked to such grants are allocated to institutes and faculties. Our administrative and financial mechanisms are very much oriented towards the faculty/department structure, and it is often difficult and complex to gather and analyze data on such institutes. It will therefore be critical to start building the administrative systems that reflect and serve these new structures and that enable rational, information-based decision-making. A series of recommendations to this effect appear in the Mann report and we should make a renewed effort to implement these recommendations.

We must foster the relationship between the University and its hospital-based research institutes, which are currently driving much of our research growth. Many of the "hot" societal issues are health-related, and our hospital-based research institutes can make unique contributions to interdisciplinary investigations. That said, we must develop a culture where these hospital-based institutes are fully integrated with our university. There are challenges: investigators at hospital-based institutes may feel isolated from the rest of the campus and thus sparsely or not at all supported by their university affiliation, while the University itself may feel its roles and contributions aren't properly recognized. A good first step would be to initiate a process that would identify barriers to integration, investigate options for reducing or removing such barriers, and implementing measures that would increase scientific and educational integration.

Finally, if we are to promote a culture of interdisciplinarity and collegiality, we have to create an intellectual and physical environment in which interdisciplinarity can flourish, and we must continue to invest in creating networks and links and in gathering people around topics of common interest, as does the "Frontiers" program. Whenever possible, we should locate researchers affiliated with institutes and centers together, and as near as possible to their faculties and departments. Graduate students must be encouraged to interact with their colleagues from other disciplines, perhaps through interdisciplinary poster days. Finally, a locale of some kind where people can interact socially is absolutely essential.

4) <u>The student experience</u>

The quality of our research programs can directly affect our ability to attract top-flight students and PDFs. We have a chance to increase graduate student numbers in our key priority areas. Attracting

top graduate students should be viewed as essential to our research success, both as an indicator of the strength of our research programs and as a source of research creativity, energy and enthusiasm. Once the students are here, creating a supportive environment in which they can conduct their research and interact with colleagues must be a cornerstone of our research development strategy.

a) Graduate students

Graduate students must be provided with fair compensation and proper laboratory and office space. We should continue with aggressive graduate student recruitment strategies, but not at the expense of lowering entrance requirements to reach number targets. We must be concerned about retention rates: we suspect that isolation could be a cause of drop-outs, so measures should be taken to encourage interaction within our student community, especially in the social sciences and humanities. We have a special mission for francophone students, so we must be especially vigorous in recruiting top francophone students. We must carefully consider how our bilingual mission affects our ability to offer a full range of graduate programs and how we can best channel our resources to meet this particular challenge.

b) Postdoctoral fellows (PDFs)

A postdoctoral fellowship should be viewed as providing an "all round" mentorship experience in preparation for the PDF's next step in her or his career, whether that be in academia or in another sector. There should be a clear statement of expectations for postdoctoral fellows – a form of generic job description. It is important to expose PDFs to all aspects of academic life, including some integration into teaching programs where appropriate. It will be important to clarify their internal "employment" or "student" status to optimize their eligibility for tax advantages and employment benefits. We should recognize that social interaction is also important and that PDFs are at a stage where they may be investing considerable time in their careers at the expense of personal relationships -- hence the importance of holding social functions, perhaps combined with personal and professional development opportunities, to which partners or spouses could also be invited.

c) Undergraduates

Undergraduate students are future graduate students, alumni, and ambassadors. It is critical that we offer them the best possible educational experience. We are concerned about a trend towards less research / inquiry (critical thinking) at the undergraduate level. Undergraduate teaching must be valued and research should be integrated more forcefully into undergraduate learning, perhaps through more research-oriented project work conducted by small groups, through guest visits and classes by senior researchers, who can discuss their research in the process, etc. We are also recommend that ways of reducing class sizes be considered, not only to optimize the classroom workload for professors, but especially to enhance the student's learning experience.

Summary of key recommendations – Creating a stimulating environment

7. The University must create places where people, students, professors and staff, of all disciplines, can interact socially. Such places are truly lacking on our campus.

8. Faculties, departments and the Central Administration must formalize their approach to the integration of young professors through such mechanisms as mentorship programs, internal grant review and advice programs, and information packages for new professors.

9. A process should be initiated to identify and implement measures that would lead to increased scientific and educational integration between the University and its hospital-based research institutes.

10. The recommendations of the Mann report on interdisiciplinarity should be implemented more thoroughly.

11. We must increase the exposure of undergraduate students to research and researchers, continue our efforts to aggressively recruit graduate students without lowering academic standards, and enhance the "mentorship" experience of postdoctoral fellows.

12. Recruitment priorities and plans for providing a supportive learning and research environment to our students and postdoctoral fellows should be clearly articulated in faculty, department and institute strategic research plans.

Aids to research

As a university, we invest in our research enterprise by providing a range of central and faculty-based infrastructure, administrative and financial support mechanisms. We must consider not only whether the "mix" of investments is appropriate, but also whether the level of support is adequate.

The Library Network plays a crucial role in supporting the research needs of the University. In the knowledge-based era of the 21st century, research required for academic success is more innovative, more multidisciplinary-, and wider in scope than ever before, and the need for rapid access to an ever-increasing range of information resources has intensified dramatically. For the University of Ottawa to retain its competitive edge and become a top Canadian research-intensive academic institution, the library acquisitions budget needs to be increased. As noted in the Library Network's strategic plan, "Our collections and information resources will facilitate research and teaching and will support the University's strategic areas of development and its multidisciplinary approach to research, learning and teaching." The accelerated pace of knowledge generation means that funding to acquire research has to keep pace with this reality. In David Mitchell's words: "A great university requires a great library."

We offer a variety of funding programs at both the central and faculty levels. These programs help researchers establish themselves and succeed in peer-reviewed granting systems or serve other strategic purposes. Both types of programs must be properly funded. Central and faculty-level programs should be harmonized, with application and review mechanisms streamlined wherever possible. Systems should be designed to track emerging needs and to help us respond quickly as new needs are identified.

We must explore what can be done to provide our students and postdoctoral fellows with the new tools they need to succeed in an incessantly more competitive environment. Some examples include the development of searchable pre-print databases and the fostering of open-source publishing in certain disciplines.

Finally, we recognize that good management is crucial. Good managers and administrators can truly allow researchers to shine, while poor management can wreak havoc on a researcher's operations. Accountability demands are increasing, resulting in a need to improve our administrative processes, implement better financial-control and reporting mechanisms, and ensure that staff have the skills they need to meet emerging standards. In this regard, we should be constantly sensitive to the needs of our research enterprise. We should therefore be seeking to develop our managers and administrators, and regularly evaluating their performance, in order to ensure the highest possible level of support for our researchers and students. We should also seek to ensure that skilled persons are available to help researchers design and manage major collaborative projects.

Summary of key recommendations – Aids to research

13. Increased support should be provided to the Library Network.

14. Internal funding programs should be re-examined for adequacy of support, effectiveness, consistency with strategic objectives, ease of access and administrative efficiency. Resource allocations and priorities should be re-adjusted as this planning exercise proceeds.

15. A working group should be established with students and PDFs to identify new tools and approaches that would help them with their work and help them succeed in a competitive environment.

16. Our professional development programs, including those for administrative and managerial staff and those for academic managers (e.g department chairs), should be assessed for consistency with current standards and for upgrading, as necessary.

Other important issues

Scientific illiteracy in Canada is a fundamental issue for our citizens and our politicians. The media is driving the political understanding of what is important, and universities are not highly visible in everyday life to the average citizen. Consequently, it is very important for us both to interact regularly with our research partners, our community and our political stakeholders, and to foster a productive relationship with local and national media.

In a similar vein, Canada does not have an independent capacity or body to advise government and to inform its deliberations, such as the US Academy of Sciences or the Royal Society in UK. Our location in Ottawa affords us a particular opportunity to interact, in person, with government and industrial decision makers. We should therefore participate in and seek to lead efforts to build and implement a strong government advisory capacity on science issues.

Finally, our location in Ottawa provides a special opportunity for our professors, students and staff to expand their professional horizons by interacting with government and industrial scientists and policy makers, perhaps through formal personnel exchange programs or by more active involvement in government policy-setting processes. This would benefit our research by enhancing our awareness of the key scientific and social considerations underlying policy development. We must therefore explore mechanisms by which our interactions with these communities can flourish.

As we have noted previously, multidisciplinary research will take on a greater importance. This will require collaboration and partnerships. It is critical that we be open to and play a direct role in such efforts at the local, national and international levels.

Summary of key recommendations – Other important issues

17. We must increase our efforts to interact with our research stakeholders and with the media.

18. We must participate in, and where possible, lead efforts to develop a strong government-advisory capacity on science issues.

19. We must explore mechanisms by which to strengthen our interactions with the Ottawa scientific and policy-making community.