

The Future of the Research University

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Summary and Outline

This paper examines the changing environment of research universities as they approach the 21st century. Its premise is that the state of Minnesota must have a first-rate land-grant research university to enrich our quality of life and allow us to compete effectively in the coming decades. This will require a creative response to critical trends in society, the economy, and education. We use our analysis of these trends, and our speculations about some scenarios to which they might lead, to propose policies which reflect faculty values and which we believe are crucial to maintain and enhance the status of the University of Minnesota as a leading research university.

Trends

1. Increasing competition in higher education, governmental units, and corporations
2. Declining sociopolitical priority of education, research, and culture, manifested in greater competition for governmental support, decline in quality of K-12 education, decreasing trust in the functions and priorities of higher education, and shifts in societal values
3. Changing workforce situation, including oversupply of Ph.Ds., approaching shortage of faculty, need for lifelong learning, and rapidly changing academic disciplines
4. Increasing role of technology, especially computer resources, posing challenges associated with on-line instruction, competition from distance-independent education, impacts on research and creative activity, and the overwhelming of understanding by information glut
5. Increasing international and multicultural character of universities and society, leading to agendas derived from economic, demographic, and political perspectives as much as from scholarly issues
6. Decreasing trust in government, and increasing demands for efficiency and accountability, causing pressures to adopt inappropriate management models and leading to deterioration of shared governance within universities

Scenarios

1. Things stay more or less the same, but get incrementally better
2. Things stay more or less the same, but get incrementally worse
3. Radical changes are driven by Internet technology
4. The university is privatized

Policy recommendations

1. Implement the recommendations and strategic initiatives proposed in *Enhancing Research Effectiveness*
2. Regularly assess programs, and act on the assessments
3. Balance demands of new and traditional fields
4. Invest in faculty productivity and development
5. Maintain and develop infrastructure
6. Develop a rational, explicit policy re non-tenure-track faculty
7. Develop better practices for graduate student recruitment, training, and placement
8. Communicate the significance of the research university to the general public
9. Provide better land-grant service to non-agricultural constituencies
10. Consider developing an undergraduate Liberal Arts and Sciences program for an integrative approach to contemporary issues and values in society

These policy recommendations are generally not novel, but they need strong commitment to be implemented in a milieu of conflicting interests. They consistently stress quality and innovation, and focus on the special mission of the University of Minnesota as a research university.

Introduction

The research university has its roots in centuries of scholarly tradition. Its current structure, however, is a product of the 20th century. The emergence of research universities in the late 19th century constituted a transforming moment in the history of American higher education. Unlike the generalist staff of traditional colleges whose task was to preserve and transmit knowledge, the faculty of research universities linked the creation of knowledge with teaching in increasingly specialized disciplines. The Morrill Land-Grant Acts in 1862 and 1890 established some universities and reshaped others with an intent to explicitly link the knowledge at the university and the needs of industry, at that time primarily agricultural. In most states, one university was designated as the land-grant and mechanical university. Teaching linked to specialized research and service trained generations of leaders in science, the arts, business, and government as well as academia.

Research universities experienced a second era of growth and change in the decades following World War II. Americans shared a deep belief in the importance of education as fundamental to the American dream and the foundation of democracy. The Cold War, the atomic arms race, the promise of scientific progress, the "space race", and the aspirations of millions of Americans fueled government investment in scholarships (i.e., the GI bill), in research, and in national agencies to fund the humanities and the arts as well as the sciences and health.

This paper examines the changing environment of research universities as they approach the 21st century. Its premise is that the state of Minnesota must have a first-rate land-grant research university to enrich our quality of life and allow us to compete effectively in the 21st century. Building on the strengths of our proud heritage and the Minnesota tradition of commitment to education, the University of Minnesota can serve as a unique meeting ground for scholars, students and the general public where learning involves the creation as well as the transmission of knowledge. As a modern land-grant university we have a mission to educate new generations, to enhance the state's cultural life, and to work collaboratively with citizens of the state to develop questions and solve problems in the process of research innovation. In an era of dramatic and constant change, Minnesota requires the leadership of a great research university.

But this is a time when change is also reshaping universities themselves. The era of rapid growth as we have known it is over and many predict a decline in the number of major universities capable of sustaining a research enterprise. We believe that for the University of Minnesota to maintain and improve its position as one of the top public research universities, a creative response to the trends outlined below will be required.

However, our goal in this paper is not just to analyze the trends affecting the research university. That has been done many times recently, often in considerable detail and with great eloquence. Rather, we aim to use our analysis of trends, and our guesses about some of the scenarios to which these trends might lead, to suggest policies which we feel have some chance of maintaining and even enhancing the status of the University of Minnesota as a leading research university in the challenging times ahead.

This paper should be read in conjunction with *Enhancing Research Effectiveness: The Foundation for Learning and Teaching in the 21st Century*, the Report of the Strategic Planning Committee for Research and Postbaccalaureate Education (University of Minnesota, 3 February 1994). This report, commissioned by the Vice President for Research and Dean of the Graduate School, addresses many of our concerns and provides a wealth of supporting data. Although we have come to them independently, many of our policy recommendations are very similar to those of *Enhancing Research Effectiveness*. This suggests another important policy for the University of Minnesota: Reports and recommendations developed by committees of our leading faculty members should be taken seriously and acted upon, rather than being ignored and consigned to bureaucratic oblivion.

Trends

In this section we attempt to identify the major trends that will affect the future of research universities. These are mainly trends in society at large, over which higher education has little influence, but which shape the environment in which we must operate.

Increasing competition

A salient trend in modern society is the increasing competition throughout the economy, in society at large, and in education. There is an atmosphere, perhaps more pervasive than ever before, that everything is up for grabs, and that it is valid for every element of society to compete for what it can, rather than relying on older relations among social, governmental, and educational institutions. There is an increasing stress on education as a means to compete, leading to heightened emphasis on science, technology, languages, and a global outlook.

Higher education

Higher education must compete for state funds with the increasing demands of K-12 education, corrections, and the needs of an aging population. Even though a healthy economy currently allows a modest increase of support for higher education, a long-term outlook suggests that resources will not be adequate to meet perceived needs. As finances become tighter and the educational enterprise more expansive, there is unprecedented competition within and among universities. There is not enough institutional funding to set up new faculty and support exploratory ventures, and suitable space is always at a premium. Rather than fostering a competition between ideas, these shortages lead to attempts to shut out some approaches so that others will have better access to departmental funding and operational control.

Adding to the competition between departments is the rise of interdisciplinary areas. Fields like biophysics, women's studies, and biomedical engineering may cross departmental, college, and even provostal lines. They often embody the newest approaches to teaching and scholarship; but they are hard to fit in existing structures, or to fund through regular departmental budgets.

Outside a single university, there is increased competition with other institutions in the state, both private and public, both long-standing and newly established, for student enrollments, state subsidies, and roles in research and outreach. Among research universities around the country, competition has gotten ever more severe for the best faculty and students, as well as for research funding. Universities are competing not only with others of their kind, but also with private think tanks which provide policy, thought, and intellectual influence as well as technical expertise.

States and countries

With the global economy and ever easier communication and transportation, states and nations have become strongly, sometimes frantically, competitive for economic development and jobs for their citizens. Increasingly sophisticated research and technology stemming from universities is seen as a key to continuing competitiveness, as is a steady supply of well-educated employees with the most modern training.

Corporations

Modern corporations likewise depend on a steady flow of new ideas, advanced expertise, and employees ready to function in diverse cultural and geographical milieus. Cutting back on their own basic research ventures to maximize their short-term bottom lines, they increasingly rely on universities for new knowledge and technology. They are an increasing source of support for university-based research, but generally only if such research is fairly directly germane to corporate

goals. At the same time, corporations have increasing fears about the ability of the current educational system to produce a sufficiently skilled workforce, and are increasingly investing large amounts in in-house training.

At the same time that all elements of society are feeling the pressures of increased competition, for which innovation is the best answer, there is an increasing tendency to play it safe: to avoid taking too many risks in order to be relatively assured of the outcome. In basic research, scholarship, and the creative arts, of course, such avoidance of real risk-taking inhibits the very adventurousness which is the justification of academic freedom in a research university.

Declining sociopolitical priority of education, research, and culture

More competition for governmental support

State support for higher education, research, and the arts and humanities is facing strong competition from other growing social needs: e.g., K-12 education, corrections, and the elderly. Recent state budgets have decreased the percentage of support for the costs of undergraduate instruction, leading to a heavier tuition burden and resulting resentment on the part of students and their parents. Federal dollars devoted to support of research are static or declining, a trend that will only get worse as the discretionary part of the federal budget shrinks in efforts to balance the budget. While NIH funding for biomedical research has held up relatively well thus far, this is more than canceled out by reduced funding for biomedical teaching and associated research due to upheavals in health care financing. Things are even worse in the arts and humanities, where there have been direct attacks on NEA and NEH programs. Added to all this are the potential impact of federal and state deficits on student loans, the decrease in which will almost inevitably drive students away from the arts and humanities into programs where the prospects for a reliable income are more certain.

Some of the relative decline in support is due to a diminished sense of the public good inherent in higher education. College education and a subsequent research degree are seen to benefit mainly the student making way towards a profitable career, rather than society which gains from an educated, productive, and creative citizenry.

Decline in quality of K-12 education

Social and family problems, along with underfunding, are causing a lack of adequate development of basic skills in large numbers of elementary and secondary students. This has various impacts on higher education, including decreased expectations for high school graduation standards and preparation for college. As the problems with K-12 education are realized, there is a move back to the 3R's, which is not bad in itself but which tends to cast other curricular subjects, including the arts and humanities, as frills rather than as essential preparation for a civilized life. Furthermore, society's concern with K-12 education diminishes its willingness to fund higher education at the necessary level.

Decreasing trust in the functions and priorities of higher education

Higher education, particularly in public research universities, has come under fire. There is criticism of time spent on research relative to undergraduate teaching, and considerable public concern focused on the quality of teaching without much documentation that it is substandard. As we well know, at Minnesota, there is increasing, if unjustified, criticism of "privileged" professors with tenure.

Shifts in societal values

Competitive economic and social trends have exacerbated a long-time concern in higher education: that the deep content and rigorous demands of an elevated intellectual and cultural life are giving way to diluted, utilitarian educational expectations and mass entertainment values. In the words of Dwight MacDonal from the 1960's, we are declining from "high-cult" through "mid-cult" to "mass-cult". This is no new concern, since it is essentially coincident with the century-long broadening access to higher education, the growing need for individuals to have college training and credentials to hold rewarding jobs, and the increasing realization of the importance of research universities to our national defense and economic well-being. To some extent, nostalgia for a utopia of learning and culture is a yearning for something that rarely existed, at least in American higher education.

However, the concept of the university as a center of disinterested scholarship and culture is an important one, representing some of the highest ideals of civilization and motivating many who choose higher education as their calling. This concept seems to be steadily eroding. Research universities, reflecting society and dependent on its support, increasingly act as if they value most those programs that generate the most money and produce the most direct payoffs, rather than those that cultivate the intellectual, ethical, and aesthetic aspects of mind and spirit. This pragmatic emphasis is potentially particularly disadvantageous to the arts and humanities. It is also destructive of the sense of intellectual community which should enliven and unify the university.

Changing workforce situation

The rapidly changing employment situation for graduates, and for society at large, has major implications for how we continue to conduct our business within universities.

Stresses are particularly severe at the graduate level. Currently there is, in many disciplines, an increasing oversupply of Ph.Ds. relative to jobs available. This is properly raising questions about the ethics of continued high production of Ph.Ds. On the other hand, we anticipate that in the next decade there will be a large shortage of faculty as the 1960s cohort retires. However, it seems unlikely that universities will have the funding to fill all of these vacancies, and replacements may often not be in the same disciplines as vacancies occur. This introduces additional uncertainty.

Traditionally, education and work have been separate phases of life. This separation is breaking down; the student who enters the U of M at age 18 and graduates at age 22 is no longer typical. Students are increasingly alternating study and work, and workers see the need for lifelong learning to stay competitive and employable.

For faculty, the rapid growth of knowledge leads to increasing difficulty in keeping up-to-date. Particularly in the sciences, there is a real danger of falling behind, losing grant support, and not being able to maintain a research career. The continuous development of new interdisciplinary areas puts severe stresses on the traditional departments, and often means that faculty must make several fairly large intellectual moves in the course of their careers.

Increasing role of technology, especially computer resources

Technology, particularly computers and digital communication, is having an enormous effect on teaching and research, and even on our fundamental ways of thinking. This section examines some of these trends.

On-line instruction

Our increasing ability to provide new types of instructional resources via the Internet and World Wide Web has the potential to improve teaching, in some circumstances and with some audiences. Information can be dynamic: assignments can be updated readily, simulations using

motion and sound can be used. Interactions can be real-time at a distance. Students who are shy in class may open up in email exchanges with a teacher, so that in some cases on-line instruction may be more "personal" than in the classroom.

Online multimedia instructional material can be very effective, but it is very time-consuming and expensive to do properly. Universities may develop a class of multimedia technology specialists, who will assist faculty with this work. National and international reputations are to be made in technology-based teaching, which will become an increasingly important part of how we judge, support, and reward teachers.

Competition from distance-independent education

Computers and the Internet provide not only the potential for new forms of instructional material, but also the increasing possibility of long-distance, off-campus teaching. This opens up new audiences of geographically isolated or home-bound students, and workers who do not have to leave their workplaces to get instruction. But these new audiences, and the traditional ones as well, may be the object of competition by non-local colleges and universities and by new for-profit companies. This poses perhaps the greatest long-term threat to the existence of traditional higher education as we know it.

Businesses are becoming increasingly dissatisfied with what they see as the unresponsiveness and irrelevance of higher education to their desire for well-trained employees. They may exert considerable financial and political influence on behalf of alternative means of providing for their needs.

Traditional students, and their parents, have also been alienated by large classes, professors who are more concerned with research than teaching, and TAs whose English language skills are not up to par. At commuter campuses like the U of M Twin Cities, these dissatisfactions are compounded by difficulties of commuting and parking, and a lack of vibrant on-campus life. The U of M has made great strides through its Undergraduate Initiative in countering these problems, but the fundamental reality remains: Unless on-campus instruction and college life are seen as providing things that distance-independent education cannot, the convenience and economy of distance-independent education may carry the day.

There are two main things that computer-based distance-independent education cannot provide. One is hands-on experience in laboratories and in the field. (Though even here, the increasing use and effectiveness of computer simulation reduces the advantage of hands-on work.) The other is the direct interpersonal contact with teachers and other students, inside the classroom and out, that is such an important part of the college experience and of life itself. Without a satisfying intellectual and social community physically based on campus, there will be increasingly little reason for traditional large campuses to continue to exist.

Computers and technology in research and creative activity

New technology is having major impacts on all fields of research, scholarship, and creative activity. The Internet provides dramatically enhanced long-distance communication and access to information resources. It thereby provides new means for developing ideas, projects and scholarly resources, and enables long-distance research collaborations without leaving the office. New scientific instrumentation allows exploration of hitherto inaccessible realms, and permits huge data collection and analysis efforts such as the human genome project. Media technology is having increasing impact on the content and definition of art, theatre, music, and dance.

These developments are exciting and will undoubtedly accelerate, but they are not without problems. New technology is posing awkward new questions about publication, intellectual property rights, and the dissemination of the products of creativity and research.

The increasing dependence of most fields of research on sophisticated computer and instrumentation resources means that those institutions that cannot garner the funds to obtain those resources will fall behind and quickly become uncompetitive. The cost of scientific research steadily outstrips the rate of inflation due to more costly instrumentation. There is increasing need for funding to incorporate technology in the arts, extending creative, expressive and technical capabilities.

These increasing costs of constant technological change, at a time when the total pool of resources for higher education and research is stagnant, have a negative impact on funding for other modes of scholarship, research and policy studies.

The impact of technology on other modes of thinking and interacting is not confined to competition for financial resources. The extent to which the creation, performance, teaching and experiencing of the arts become technologically driven, oriented, and judged – or, on the other hand, serve as a relief from a technological society – is uncertain. The answer may vary by nations, regions and groups, either uniting (and homogenizing) us, or dividing us further.

More information, less understanding

Technology has given us increased access to more information, but at a cost. Distinctions become blurred between information, knowledge, and opinion, facts and ideas, technique and content, essential and incidental. The information glut produces frantic conditions that preclude analysis, reflection and the search for wisdom. The basic content, scope and depth of higher education are challenged by an information explosion and a mass culture that makes few intellectual demands.

Increasing international and multicultural character of universities and society

Research universities mirror society in becoming more global and multicultural. Social forces lead to agendas derived from economic, demographic, and political perspectives as much as from scholarly issues.

Internationalism

The academic community is increasingly international. There are more international students and exchange programs in both teaching and research. Scholarly reputations, and hence faculty mobility, are global. Research collaborations, facilitated first by jet planes and now by the Internet, flourish around the world. There is increasing international competition for research visibility, facilities, and funding. Higher education and research have greatly increased in value to businesses which operate internationally.

Multiculturalism

Changes in national and community profiles by race and ethnic group, and the changing demographics of the U.S. workforce, are reflected in the university. From now until the end of the century, 88% of workforce growth will come from women, Blacks, and people of Hispanic or Asian origin, including immigrants. White males will be retiring from the workforce in record numbers. The proportion of older people in the population is increasing dramatically, with a corresponding increase in political influence.

These changes in society lead to increased tensions within the university over the appropriate values and means to prepare for and manage change. Issues from affirmative action to curriculum content are affected. There is continuing debate between notions of culture in singular and multiple terms. More resources are needed to provide access to higher educational opportunities for minorities and economically disadvantaged groups, at a time when state

investment in higher education is decreasing and affirmative action programs are being challenged in the courts.

Decreasing trust in government, increasing demands for efficiency and accountability

Universities have become larger and more complex; are consuming more of society's resources; are more central to the aspirations of individuals, corporations, and governments; and are more involved in the divisive debates of a rapidly changing society. It is therefore inevitable that they are subject to demands for greater accountability and more efficient management. These demands are particularly difficult to meet, and are often inappropriate, in a research university. This is exacerbated at state universities by a decreasing trust in government and a corresponding increasing admiration for the supposedly more efficient management tools of the private sector.

Corporate models are increasingly invoked to develop management patterns for higher education. When applied to universities, corporate thinking often confuses content and product. Scholarly and creative activity may be inappropriately evaluated by market criteria that emphasize financial returns. Activities, in the arts and humanities and in some of the more recondite branches of scholarship, that do not lead to clear and immediate financial returns may be held accountable to unsuitable measures of outcome. It is difficult to create commonality between wise decisions and accountability, when accountability is defined mainly in technical terms and removed from trust in expertise.

The emphasis on management leads to increasing diversion of faculty and administrative time to deal with issues of accountability, image, and planning. Such diversion has a negative impact on long-term strategic thinking and on ability to focus on fundamental, content-based tasks.

There are increasingly harsh debates over the size, scope, span of control, and responsibilities of educational bureaucracies - governing boards, university administrators, etc. These debates degrade previously productive working relationships, and increase the politicization of education policy discussions. They lead to declining morale of faculty and administrators, and declining public trust of universities.

Four scenarios

In this section we speculate on four ways in which the trends identified above may play out, for better or worse.

1. Things stay more or less the same, but get incrementally better

- Politicians, influential citizens, and the people at large come to feel that better higher education and more research is required if Minnesota and the US are to stay near the top economically.
- There will probably be continuing demands that teaching and research be more immediately and obviously relevant.
- Individuals, and the sociopolitical system, will recognize that higher education, and continuing education, are necessary to meet rapidly changing conditions in the workplace.
- Faculty will be under pressure to be more flexible in who, what, where, and when they teach, to accommodate life-long learning. Extension courses will become part of regular teaching, and will be in-loaded.
- Some parts of in-house education by corporations might shift to the university, if the U of M were receptive and prepared.
- K-12 education eventually improves, now that people have realized how bad some schools have

gotten. Students will enter the U of M better prepared and better motivated.

- Corporations turn more to U of M for basic and collaborative research. This will provide more funding, but will produce pressures for short-term payoffs and complicate free dissemination of information.
- A few years from now, new Ph.Ds. will have an easier time finding faculty positions as the 1960's cohort retires. In many fields, worthwhile non-academic positions will open for Ph.Ds. To prepare them for such positions, Ph.D. training will become broader and less specialized.
- Faculty whose research fields have become obsolescent will be recognized as a valuable but under-used resource. Programs to modernize and retrain them, and more collaborative research efforts that combine their expertise with those of others, will be developed.
- U.S. higher education continues to be recognized as the best in the world, and the best foreign graduate students continue to come here for training, bolstering our research efforts and pool of talent.
- Computers and sophisticated instrumentation continue to enter academic areas, but at an affordable rate and in ways that enhance efficiency and capabilities.
- Long-distance research collaborations, national and international, become more common on the Internet. Access to shared data and ideas becomes much more rapid and convenient, facilitating existing research and enabling new kinds of scholarly activities.
- Instruction on the Internet becomes more common. It is recognized as a modality that is very useful for some purposes, but it does not replace the person-to-person contact that is so important to the intense teaching-learning activities of a research university.

2. Things stay more or less the same, but get incrementally worse

- Federal funding for research declines, as the discretionary part of budget is cut disproportionately. Competition for research funding becomes even more intense, with lower success rates. Only the top 20-30 universities (many of them private) retain the infrastructure and faculty vitality to stay broadly successful in the competition.
- Biomedical research and teaching are particularly hard-hit by decreases in health care reimbursements and patient flow.
- Corporations continue to support some university research, perhaps even to an increasing extent; but demand more proprietary and targeted research, and greater restrictions on publication of results.
- As domestic investment in research declines, other countries become leaders. This produces a downward spiral in our technology-based economy and in our cultural leadership.
- Minnesota, as a relatively small state, feels that it cannot put enough resources into higher education to remain competitive. Technology-based state industries increasingly look to universities in other states for research collaborations.
- Fewer talented people are attracted to careers in research, scholarship, and the arts, leading to decreased innovation and ability to teach at the forefront.
- Fewer bright students come from other countries, lessening both our pool of talent and our positive influence on the rest of the world.
- Corporations decide that students are inadequately trained by universities, and substantially increase their in-house education programs. This reduces both tuition revenue and influential support for public higher education.
- As university research declines, teaching loads go up. Fewer faculty are needed, and tenure

comes under increasing pressure.

- Many faculty positions vacated by retirement are not filled, increasing work loads and losing opportunities to revitalize faculty.
- Declining job prospects for Ph.Ds. leads to fewer grad students, and demoralization of those that persist.
- Graduate education and research are viewed more vocationally, rather than as a lifetime commitment to a life of the mind. There is a demand for more "just-in-time" training, short courses, etc.
- Decreased funding limits ability to keep up with advancing technology. Research facilities fall behind state-of-the-art, further handicapping competitiveness for federal funding. The U of M is unable to upgrade computer systems and networking adequately.
- Courses on the Internet, offered by other educational institutions and private companies, compete significantly with campus-based offerings. This cuts into tuition revenue and lessens loyalty to the U of M.
- Availability of distance-independent education from other sources means that some courses need not be offered locally, decreasing need to hire or replace faculty.

3. Radical changes are driven by Internet technology

- Radical transformations in higher education could come about if Internet activity and resources continue to develop. Class notes, interactive groups, library resources, etc., now make it possible to hold classes on-line. Researchers can share data, discuss ideas, ask questions, control telescopes, etc., at a distance. While these things are currently in an early stage, they are developing rapidly. They could greatly change the way we teach and do research.
- Instruction will largely come from off-site rather than on-campus faculty, and students will receive many of their courses at home or at dispersed satellite sites. This will exacerbate trends at the Twin Cities campus, where tendencies of students to leave campus are already high.
- On-line teaching is not all bad. It brings the virtues of telecommuting to the educational sphere. It may allow better communication, and more flexible use of teaching resources, than in many classrooms.
- To demonstrate the virtues of on-campus teaching, teachers will be under pressure to use more active, participatory teaching strategies. Greater emphasis will be put on faculty-student and student-student personal contacts.
- Students will have a broader variety of educational institutions to choose courses from. The concept of "transfer student" will be remarkably broadened, and certification of courses for a degree program will need some standardized rules. The CIC will play a role in this, as will accrediting associations.
- Private companies may offer on-line courses, paying large fees to prominent faculty to develop courses that attract a national and international clientele (e.g., a Paul Samuelson course in Economics, a James Watson course in Molecular Biology). Assuming these courses are academically respectable, pressure will grow to let them count for credit.
- Such developments have the potential to severely drain enrollments in local courses, particularly the high-enrollment ones that generate the most tuition revenue. The dire consequences for university budgets are obvious.
- Faculty will spend more time developing on-line material. This will come to be seen as a valid professional role, and will generate significant income both for the faculty and for the institution. But competition will be international rather than local.

- Graduate students will find new TA jobs responding to students on-line, and grading on-line papers and exams. There will be an international market for such services.
- Computerized tutorials and grading will become more prominent, reducing the need for TA manpower.
- While on-line education could be economically disastrous in competition with large-enrollment courses, it will have major advantages in more advanced, lower-enrollment specialty courses. Departments will be able to specialize, and can call on other institutions with other specialists to teach courses that are deemed important but that cannot be offered locally.
- Internet resources are already crucial in many fields of research (e.g., physics preprint archive at Los Alamos, DNA and protein sequence databases, Medline and Current Contents). These will only grow, and institutions that do not maintain the infrastructure to provide convenient access to them (e.g., high band width networks for graphics and multimedia) will soon no longer be competitive.
- The Internet, through email, enables international research collaborations, almost in real time. This both reduces the need for scholarly travel, and makes it easier for scholarly travelers to maintain contact with their home base.
- Aside from personal contacts (which are often inadequate at big research universities) and access to hands-on shared resources and activities (e.g., laboratories, performance practice) there is remarkably little in higher education that cannot already be accomplished by "academic telecommuting". Mechanisms are still clunky, library access spotty, etc., but these problems will inevitably lessen in the next couple of years.
- People who use email to communicate with their professional communities, and their students, will increasingly find that it is in many ways as satisfactory and convenient as face-to-face interaction.
- The main questions are likely to be: how will on-line instruction be paid for, and will it be certified? Taking all costs and potential cost savings into account, higher education on the Internet might be cheaper than traditional campus-based activities, though this speculation needs to be carefully examined. If so, it could pay for itself, leading to increasing societal pressures to reduce spending on higher education if an equivalent product can be obtained more cheaply.
- What is "equivalent" depends, in practical terms, on questions of certification and accreditation. These activities are now largely carried out by the higher education community itself. But business is playing an increasing role, making clear that it needs suitable training for its employees, training which does not necessarily come from research universities as currently constituted. And accreditation can be influenced by political pressures. If legislators and their constituents are convinced that they can get an equivalent product at lower cost, accreditation of on-line universities will not be far behind.
- From the point of view of universities as currently constituted, this scenario would be a disaster. But from the point of view of society at large, the disaster is not so clear. What is needed is a deeper understanding of the ways that universities function as communities of interacting teachers, learners, and researchers, and to what extent such face-to-face interactions cannot be replaced by electronic ones.

4. The university is privatized

- "Some of the nation's most successful public research universities, feeling a disconnection between their internal values and the priorities of their state patrons, now ponder futures as independent or quasi-independent institutions that rely primarily on their own competitive ability and the generosity of their alumni." *Policy Perspectives* (1996).

- Recognizing that a relatively small percentage of the total University budget comes from state funding, we may come to feel that the battles we fight and the compromises we make are not worth the funding we receive. If state government and the public cannot understand the value of the University to the state and region, perhaps the public character of the institution is dispensable.
- Revenues would be generated from all current outside sources, and perhaps some (e.g., some types of foundation support) which now go mainly to private universities. State subsidy of tuition at private colleges would presumably extend to the privatized U of M.
- Tuition would be raised to reflect the actual costs of education, with financial assistance to less-well-off students.
- We could focus on what the U of M does well, rather than doing things that could be done by other institutions, or might just as well not be done at all, because there would no longer be public constituencies with a strong claim on the university.
- We could be like the University of Chicago and get rid of big-time sports.

Policy Recommendations

The trends we have identified are in large measure out of our control, and whether any of the scenarios we have constructed actually plays out remains to be seen. The most difficult task faced by leaders is to decide on long-term policies that will be useful whatever the future brings, maximizing benefits if fair winds blow and sheltering against harm if the weather turns nasty. In this section we present our recommendations for policies that should be followed by the Board of Regents, President, and other central academic officers of the University of Minnesota. We believe that these policies constitute the best route to maintaining and improving our position among the leading research universities of the world, and thus to maximizing our contributions to the citizens of Minnesota.

1. Implement the recommendations and strategic initiatives proposed in *Enhancing Research Effectiveness*

It seems appropriate to begin this section on policy recommendations by urging that readers (re)acquaint themselves with the recommendations made in *Enhancing Research Effectiveness: The Foundation for Learning and Teaching in the 21st Century*, the Report of the Strategic Planning Committee for Research and Postbaccalaureate Education (University of Minnesota, 3 February 1994). This report, written by a dedicated and insightful group of some of the U of M's best faculty under the aegis of the Vice President for Research and Dean of the Graduate School, examined the external and internal environments for research and graduate education. They amassed a large amount of useful data, and used it to develop a set of recommendations, which we summarize here in outline form:

1. Evaluate quality
2. Develop the faculty
3. Implement strategic initiatives
 - a. Improve funding mechanisms for postbaccalaureate students
 - b. Develop and enhance interdisciplinary research and education
 - c. Promote and implement external collaborations
 - d. Collaborate with CEE (now the new University College) to evaluate state needs and develop new applied Master's degrees to meet these needs
 - e. Improve the infrastructure necessary for future innovative research and postbaccalaureate education
4. Communicate the significance of research

We have approached our task in writing this paper in a less data-driven, more impressionistic fashion than used by the authors of *Enhancing Research Effectiveness*. But we are struck by the similarities between their conclusions and our own. We are also mindful of the tendency at the University of Minnesota (we doubt that we're unique) to overlook or ignore previous reports when writing new ones or when making policy decisions. We have tried to resist this tendency, by calling attention to the excellent work already done by our colleagues and urging that our recommendations be viewed as reminders and reinforcements of their work.

2. Regularly assess programs, and act on the assessments

As the authors of *Enhancing Research Effectiveness* noted, programs should be judged according to the criteria of quality, basic nature on which other disciplines depend, centrality to state needs, comparative advantage, efficiency and effectiveness, and anticipated future demand. Both U of M faculty and outside experts should be enlisted to perform these assessments, which should take place every 7-10 years.

The Graduate School currently undertakes such reviews, and accreditation teams in some disciplines also provide assessment. However, the results seem seldom to be used in any significant way. If more resources are recommended, they are rarely available. If reviewers take the rare step of actually severely criticizing a program (surely *some* are so suboptimal on the criteria listed above as to warrant dissolution), the program usually escapes the consequences it deserves. The futile recommendations of the Campbell Committee are a notorious example. If assessments are to achieve their intended goal of improving the U of M, their recommendations must be heeded.

There will probably have to be some major reallocations of resources to support those parts of the University of Minnesota that score highest on these criteria. It is more important to support the best and most important programs well, than to support everything at a mediocre level.

3. Balance demands of new and traditional fields

If the University of Minnesota is to remain a leading research university, it must find ways to balance demands of new fields and emerging interdisciplinary areas with those of traditional departments and programs. This is particularly difficult under current circumstances, since realms of knowledge are growing with unprecedented rapidity, while resources are holding steady at best.

An opportunity to move resources into the most promising fields will arise, however, as the large number of faculty hired in the 1960s begins to retire in the next decade. Faculty and academic administrators should thoughtfully examine existing programs and new possibilities in reallocating these positions. While faculty and department heads must be strongly involved in this examination, their investment in existing programs often makes it difficult for them to recommend major change. Therefore, deans, provosts, the Vice President for Research and the Academic Vice President must be strongly engaged *intellectually* with faculty in charting the future of the university.

There are several ways in which this ongoing intellectual renewal can be accomplished, all of which must be pursued simultaneously:

- Convene regular (every 7-10 years) examinations of major areas, with U of M faculty and a few outside experts, to decide where major fields are going, and how and whether to reorient programs. This should be done as an aspect of program assessment (see the previous section).
- Hire new faculty who represent desirable new areas.
- Try to hire faculty who are intellectually adventurous and ambitious enough that they will

continue to pioneer new areas throughout their careers.

- Value collaborative, interdisciplinary activities when rewarding faculty.
- Provide opportunities, time, and resources for faculty to develop research programs in new areas. Sabbaticals are the usual way to do this; the sabbatical program should be made more flexible, and benefits should be improved.
- Explore possibilities to develop cooperative programs with other states in areas with lower priority and demand.

4. Invest in faculty productivity and development

If programs are to be assessed regularly and changes made as a result, and if some traditional departments/programs are regularly to give way to new fields, then faculty will have to play the lead role. They must be encouraged and helped to keep up and to change. (See the FCC White Paper on Faculty Vitality.)

If we are to attract and retain top faculty, we must pay competitive salaries. As has been amply documented, U of M salaries have fallen well below the norms for the leading research universities. A top priority must be to raise current salaries and keep them at competitive levels.

If faculty are to have the time and energy to participate in developing the future of the University of Minnesota, let alone taking care of their current responsibilities for teaching, research, and service, they need an adequate standard of supporting services. In many units, support has fallen well below optimal or even minimal levels. Secretarial support, janitorial services, office supplies, computers and networking, and travel to meetings have all been sacrificed to budgetary shortfalls.

We believe that greater efficiencies in other aspects of U of M operations could help pay for better faculty salaries and support services. However, we feel that if no other resources were available, it would be advisable to shrink the faculty slightly and devote the money released to proper support and compensation of those who remain.

Faculty, like other people, perform better when they are recognized and rewarded for outstanding accomplishment. We should build on existing reward programs for faculty: Morse-Alumni program, McKnight Land-Grant, research awards, etc. In an institution where people do not often feel appreciated and rewarded for the excellent work they do, there is need for ongoing efforts to maintain the existing programs, and perhaps to increase them. Morale at the university is low, and such efforts are a fairly inexpensive way of saying to the faculty that what they do is important. A parallel to the Morse-Alumni Awards for graduate teaching has been discussed and should be implemented.

Most of the development of new areas of research and teaching in the next decade or two will be done by current faculty, rather than new hires. Therefore, strong support should be given to helping faculty develop interest and expertise in new directions. One may estimate the fraction of faculty whose research directions should change periodically. Suppose that sabbaticals or leaves are taken every 7 years, half to pursue current research and half to learn a new area. Thus a change is made every 14 years on average, or 2-3 times during an average 30-year career. Approximately 1/14, or 7%, of the faculty would change interests each year. Approximately the same percentage of UM academic personnel resources should be devoted to supporting such change.

As an alternative to the traditional sabbatical, we urge development of a program of on-campus leaves, in which faculty move to another part of campus to work with experts in another field. The U of M, virtually a world in itself, has enormous resources for its faculty to learn from and with each other. Traditional away-from-home sabbaticals are underused, because they don't pay a full salary and because faculty with working spouses cannot readily leave the Twin-Cities for extended periods. Much less expensive, and potentially just as productive, are on-campus leaves.

If relief from teaching, committee work, and habitual distractions can be arranged, working and learning in a new environment on campus can provide virtually all the benefits of a normal sabbatical, with much less personal disruption.

5. Maintain and develop infrastructure

Any institution that cannot provide its faculty and researchers with state-of-the-art equipment, facilities, libraries, and communications technology will be unable to maintain its position as a leading research university. Infrastructure is expensive, and trade-offs with faculty and student body size will have to be made. We urge a choice of quality over quantity.

Research equipment is becoming more expensive, and funding agencies are expecting more matching funds from universities. The UM must not fall behind. Faculty are increasingly expected to raise grant funds to pay for new equipment. This is not unreasonable, but it must be remembered that sometimes equipment must be there in the first place, before faculty can do the new types of experiments that bring them to the cutting edge and make them competitive for grants.

Whatever one thinks about the impact of networking and the Internet on the future of the research university, modern computers, wiring, and access to the Internet will have to be there. Some parts of the UM will have to be modernized more rapidly than others, but all will need it sooner or later. We need not only computers, but training and support for using and troubleshooting them. Otherwise, more faculty time will be lost than gained.

We should maintain an alert but guarded attitude toward distance-independent education. A gradient of increasingly non-traditional possibilities is emerging. Posting of instructional material (lecture notes, assignments, etc.), submitting and receiving feedback on assignments, and question-and-answer by e-mail on-line are becoming routine. Real-time on-line conferences are not uncommon. On-line audiovisual presentations and conferences require more bandwidth and higher-powered equipment than commonly available today. We believe that there is much scope for useful development here even at the low-tech end, that faculty should be recognized for innovative approaches, and that suitable technical support should be provided.

However, there should be careful consideration of the costs and benefits of the more expensive technologies. We believe that education is still largely best carried out by face-to-face interactions of teachers and learners. The University of Minnesota will serve its mission better if it continues to invest in improving on-campus community, rather than diverting too many resources to technologies that make it easier to ignore the campus.

6. Develop a rational, explicit policy re non-tenure-track faculty

There are certain areas (e.g., languages, calculus) where we need to give a lot of elementary instruction but where it may not make sense to have all of those instructors doing faculty-level research. There are other areas (e.g., large introductory science classes) where multimedia instructional development at a professional level will demand faculty-level skills but where the duties are exclusively teaching. There may be other areas where we will wish to have long-term independent researchers who have no teaching responsibilities. In all of these cases, we will be using faculty-level people who are not appropriately tenure-track or tenured faculty. This group is very likely to grow in the next few years.

Many research universities have people in such classes, and may well have developed appropriate bureaucratic personnel policies for them, but the educational implications are not often discussed. The arguments for tenure and academic freedom give little reason to exclude them from tenure track. Indeed, a long-term commitment to the curriculum and to the institution argues in favor of putting them on tenure track. The two main reasons for not putting them on tenure track are that they do not carry out all the functions of regular faculty, and that the institution needs flexibility to downsize and change direction.

We recommend that the University of Minnesota undertake a more explicit discussion of our policies in this area than we have done to date, involving a wide range of faculty, academic professionals, and administrators. Academic freedom for non-tenure-track faculty needs to be clearly protected. Such discussion will be important to our understanding of ourselves as an institution, and to our ability to attract and retain talented teachers and scholars who are not put on tenure track.

7. Develop better practices for graduate student recruitment, training, and placement

The American basic research enterprise is unusual in being located mainly in research universities, rather than in research institutes or academies of science as in most of the rest of the world. Many ascribe American research preeminence to this system, and graduate students are at its heart. They help faculty with research, provide the audience for advanced courses, carry an important share of the teaching load as TAs, and apprentice to be the researchers, scholars, and teachers of the next generation. The best young faculty are generally drawn to the universities with the best graduate students.

Recruitment of graduate students to Minnesota is, in at least two ways, suboptimal. First, the recent large increase in fringe rates for graduate assistants has made them harder to afford. This raises questions in the minds of many faculty whether it wouldn't be more productive to give up on graduate students and hire postdocs and technicians instead to work on research projects. We urge that the Dean of the Graduate School continue to work with other administrators to assure that costs for graduate students are competitive with those at other research universities.

Second, in fields such as molecular biology, where similar work is done in several departments and graduate programs, prospective students are confused about which program to apply to, and the total strength of the faculty is obscured by fractionalization. We recommend that graduate programs, where necessary, be restructured for optimal efficiency and visibility.

While we need to recruit better graduate students, we also need to realize that suitable jobs, whether academic or non-academic, are scarce for the increasing number of Ph.D.s. we are training. Even though there may be a large number of faculty vacancies when the 1960's cohort retires, it will not be nearly large enough to absorb all the talented students we have produced. This is not a problem unique to Minnesota.

There are two complementary approaches to this problem. The first is something we can and should do at Minnesota, regardless of what the rest of the country does: become better mentors to our graduate students. We should help them learn about alternative job possibilities, and we should convey, explicitly and implicitly, the attitude that these jobs can be just as worthy and rewarding as faculty positions. Many faculty know little about this ourselves, so we will have to enlist the help of non-academics, who know from first-hand experience how a Ph.D. in some specialized discipline can be put to good use in the outside world. We should also develop systematic programs on the responsible conduct of research. These should cover not only obvious topics such as fraud and plagiarism, but also the ethical treatment of animals and human subjects, the problems of collaboration and coauthorship, and the mutual obligations of students and mentors. These programs should also train students in the communication skills that are essential for professional success. Faculty in each graduate program should take the lead in developing these mentoring activities in a form most appropriate for each discipline, while the Graduate School should provide support and establish overall expectations.

The second approach to an overabundance of graduate students can only be assayed by national collective action and change of attitude. We need to think seriously, within the community of research universities, about whether we are producing too many Ph.D.s. This is a controversial question, with different answers in different scholarly disciplines, but the general conclusion seems inescapable: The mathematics of exponential growth - each professor producing numerous

Ph.Ds. who become professors who produce numerous Ph.Ds., etc. - has caught up with us. The great post-World War II expansion of universities is over, unlikely to come again to employ large numbers of aspiring faculty; and even the increasing opportunities for Ph.Ds. outside of academia may not be sufficient in many fields to provide enough suitable jobs.

This confronts us with a real dilemma. We have come to rely on graduate students to do much of our research and teaching, in what has until recently been a productive and mutually beneficial system; and a lot of our professional prestige is tied up with how many Ph.Ds. we produce and place in faculty positions. Any research university that decided on its own to cut back on Ph.D. education would be engaging in the academic equivalent of unilateral disarmament, with suicidal consequences. If Minnesota wants to remain in the ranks of top research universities it must (given existing academic values) take the attitude that, while there may be an excess of Ph.Ds., it's up to the other universities to cut back, while we go full speed ahead.

We should "... approach graduate education, biomedical scientist workforce planning and the ways in which scientific research is staffed and carried out quite differently than we have in the past." (Ruzek *et al*, 1996). These words, from a study of the biomedical research system, apply equally to all fields of scholarship. We *could* do it differently, relying more on career technicians to staff our research programs, and on non-tenure-track faculty to staff sections of our big introductory courses. The results might be better much of the time, since we would spend less time training neophytes, and long-term staff would develop valuable expertise. But this would make our research enterprise more like that of the rest of the world, depriving us of the unique arrangement combining graduate education and research that has been so productive. We would lose the occasional flash of brilliance from an exceptional graduate student, the enjoyment of interacting with developing young researchers, and the satisfaction of training new generations of scholars. An intermediate approach would be to restructure the standard Ph.D. program, exchanging the intense focus on a deep but narrow research problem for broader, less specialized education that would better equip Ph.Ds. for careers outside of traditional scholarship.

It is hard to make a recommendation of the best course, except to urge that this is an academia-wide problem that calls for an academia-wide solution. The University of Minnesota could make a valuable contribution by taking a leading role in the discussion.

8. Communicate the significance of the research university to the general public

The recent brouhaha regarding tenure has made it clear that the public has little understanding of the significance of the University of Minnesota as a research university, or of the distinctive role of faculty for whom research is a major responsibility. We feel that it is essential that the U of M work harder and more effectively at communicating with the general public how our activities benefit the state, if we are to have any chance of maintaining the support that we need.

The primary organization charged with this responsibility is University Relations. It needs to be reinvigorated and expanded, to serve a positive, proactive purpose. Faculty recognize as never before the importance of favorable publicity. Regular communication should be promoted between University Relations writers and U of M faculty to develop stories for local and national media. Stories that personalize faculty work, in addition to describing its intellectual and social benefits, will be most effective in garnering sympathetic support for the university. Faculty are increasingly being asked to appear on radio and television; media training provided by University Relations or private communications firms would make them more effective.

Faculty should also make more of an effort to interact with the general public, participating in community affairs and talking to civic groups about their work and about the University in general. There should be more contact of Twin Cities faculty with outstate Minnesota. University Relations should assist these efforts by developing speaker kits and fact sheets. Faculty should

also take the opportunity to tell students in classes about their research. This both enlivens courses, and educates students to the fact that faculty do things other than lecture in front of their classes, a lesson that may pay dividends when these students become regular citizens and taxpayers.

The University of Minnesota has devoted considerable effort to disseminating the general message of the economic benefits to the state of our research and teaching. This has been effective, and needs to be continued. It might be expanded to include indirect benefits from a highly educated citizenry and the rich cultural milieu of the Twin Cities, as well as direct benefits from job creation in high-tech industry. There is a rich "economics of higher education" literature that would be helpful here. We are increasingly being asked to provide statistics on improvement in our teaching and research performance. We now have about 20 critical measures. That is probably too many to make an understandable case to the outside world. We should pick a few to emphasize. They must be persuasive to the citizenry, and emphasize academic values at least as much as financial success.

9. Provide better land-grant service to non-agricultural constituencies

The U of M is a land-grant university, and has generated much good will throughout the state by Agricultural Experiment Station and the Minnesota Extension Service. As the population of Minnesota becomes less agricultural, it becomes a challenge to carry out the land-grant mission via non-agricultural activities. Such service often requires coordination of expertise from several disciplines. This provides the opportunity of serving the people of the state while developing mechanisms to bring faculty and staff together from across the university.

Outsiders often complain how difficult it is to find faculty with relevant expertise within the U of M. It would be worthwhile to develop a database of U of M faculty research expertise and specialized research resources, and a means of making this information accessible to the outside world. A single contact point in University Relations seems desirable, perhaps supplemented by a publicly accessible and searchable WWW database to be developed by ORTTA.

10. Consider developing an undergraduate Liberal Arts and Sciences program for an integrative approach to contemporary issues and values in society

As research becomes more specialized and competitive, financial pressures more acute, and faculty lives busier, the community of intellect within the university has suffered. This has led to an increasing status dichotomy between those fields which can get grants, and those which can't. It has enhanced the professional and career-oriented programs of the university, with wealthy supporters and alumni, at the expense of the core liberal arts and science departments. It has led to fragmentation of the undergraduate curriculum. And it has diminished our lives as members of the academic community. Most faculty feel they no longer have time to eat together at the Campus Club, or to meet in discussion groups to tell each other informally about their different lines of research.

Responsibility Center Management, now known as Incentives for Managed Growth (IMG) might exacerbate the trend if not appropriately directed. If there is not an institution-wide commitment to protect the central arts and science core of the University as IMG arrives, the University will devolve into a set of specialized technical programs without a firm undergraduate structure. Several years ago the Twin Cities campus put into place a new Liberal Education undergraduate curriculum. While it somewhat reduced the jumble of options and addressed many important concerns, it still presents a menu of choices rather than a coherent intellectual experience.

We feel that an essential aspect of the university is being lost, and with it an essential benefit that the university has, at least as an ideal, offered its students and the community at large: the thoughtful, collective examination of the most central issues facing society. We recommend that the University of Minnesota consider developing a new undergraduate program that will focus on an integrative approach to contemporary issues and values in our society, bringing to bear the

expertise of interested faculty from a wide range of disciplines. One example is Prof. Harvey Sarles' suggestion of the theme "Study of the Present Age". Another suggestion is "The Human-Technology Interface", and there are certainly many other interesting possibilities. The theme might change from time to time, but should always involve science and technology as well as humanities, arts, and social sciences.

We imagine that this program will appeal to a fair number of students as an interdisciplinary major. We believe that a significant number of faculty, perhaps several dozen, would wish to become involved in devising and teaching courses in this theme. Instruction would involve more writing and discussion, less lecturing, than in most undergraduate courses; there would be an emphasis on team teaching. Teaching in this program would substitute for equivalent teaching in the home department. We think that it could come to be regarded as the most meritorious and rewarding teaching in the university.

Developing and implementing such a program would require a lot of work and resources, and it should not be undertaken without considerable study and discussion. However, we should view this program not as a kooky alternative learning enterprise, but as the sort of activity that is absolutely central to our mission in a research university: focusing the integrated research expertise and wisdom of its leading faculty on the education of its best undergraduates. The program could foster a revitalized spirit of cooperation and rededication to the fundamental values of liberal education in a research university.

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