The Society of Research Administrators International will hold its annual international meeting on October 13-17, 2007 in Nashville, Tennessee. This year marks the Society’s 40th anniversary with a special commemorative theme “Celebrating Our Heritage: Past, Present and to Come.” The cover for this edition of the Journal of Research Administration captures a Nashville image that highlights this year’s anniversary theme. One of Nashville’s many attractions is a fascinating replica of the Parthenon of ancient Athens. Like the original Parthenon, the historical tradition of research administration stands out against the skyline supporting academic and professional inquiry. Like the replica of the Parthenon that today graces the city of Nashville, our historical tradition is ever in the process of adaptation and reshaping for a globe needing the benefits of research. Finally, just as ancient structures serve as the foundation for contemporary life, research administrators always remain open to the challenges of the future and the invitations to service-innovation for the benefit of others.

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Change is never easy. The older I grow, the truth of this timeless maxim increases in my experience. There is a part of me, in my “maturity,” that wishes for fewer complications, fewer permutations, fewer disruptions, fewer invitations to make things different than what they have seemed always to be. However change, mutation and discontinuity are part of the very stuff of life. They are an essential part of the brilliance and excitement of human living. Perhaps it is just that as we grow older we look for something far deeper in the invitations to change that come our way. Perhaps our impatience with change is a refusal to be satisfied with the more facile and evanescent changes of our yesterdays. We look for something deeper in our human journey today and for the years to come. I would suggest that this is perhaps an important reflection for all of us as we enter into our 40th anniversary as members of the Society of Research Administrators International.

This October, as we gather in Nashville for our international meeting, our theme will be “Celebrating our Heritage: Past, Present, and to Come.” Perhaps one way of entering into the spirit of this theme in a personal and professional way is to ask ourselves where are the next horizons and challenges for each of us as research administrators, executives and members of SRA. Our profession was born out of a functional need. We have grown far beyond that. Today we have even become intimately integrated into the development of the research mission-horizons of each of our institutions. Being part of the research journey commits each of us to the unfolding horizons of our institutions and the nations and cultures they serve. Inevitably, this means being part of an evolving experience that absolutely involves change, challenge, occasional disruption, and inevitable discontinuity. It is to the Spirit of Challenge for the unfolding journey of our profession that this edition of the Journal of Research Administration is dedicated. It is my firm belief that reflecting on our challenges is the best and most fruitful way for us to enter into our anniversary year.

This edition of the Journal focuses on invitations and discontinuities that are challenging the horizons of our profession. Change and challenge are realities that confront us every day. While we live in continuity with our individual and communal selves from year to year, we also live in discontinuity and are confronted with unexpected invitations to quantum leaps that meet us quite profoundly. Our profession is no different than our individual human lives. As we celebrate our 40th anniversary, our authors give us profound reason to reflect upon a wide variety of challenges, inviting us together to new or deeper forms of self-conception, leadership and service in our research communities.

Dr. Timothy Atkinson and colleagues ask us to consider what is the meaning of our profession from the perspective of public service. They ask us to wonder if we truly understand the public service dimensions of what we do. In a new Journal feature where we welcome the reflections of researchers as they experience research administration, Mr. Harold DeMonaco and Dr. Greg Koski challenge our present panorama of traditional services with the realities of new and emerging research and healthcare technologies. Their work poses whether we are ready to reshape our thinking and our service in the light of new technological advances. Dr. Carol Fedor
From the Editor’s Desk

and colleagues remind us in their work that the world of research administration contains a serious commitment to ethics and integrity, not just regulatory compliance. From an international perspective, Mr. Scott Rutherford and Dr. David Langley challenge us to reflect upon the ingenuity and persistence it requires to integrate, develop, maintain and deepen the contributions of information technology and knowledge management in research administration. In the first of two articles on the subject, Dr. Sally Aboelela and colleagues pose a very academic challenge to the traditional “silos” of institutional life as they discuss “interdisciplinarity” and the evaluation of interdisciplinary centers using social network analysis. Finally, Dr. Cliff Studman challenges us to expand our traditional geographic limits to appreciate the development of research administration processes from around the world. These profound articles are complemented by a government and law review by Mr. J. Michael Slocum, and a human resources review by Ms. Marcia Landen. The Spring 2007 Journal concludes with another excellent edition of Voice of Experience whose regular authors welcome this time the additional contributions of Dr. Pamela Miller and Mr. Joe Cervelin.

It is curious that each year the first edition of the Journal emerges in the Northern hemisphere’s springtime. Spring is the season of new beginnings. We often think of it with a certain spirit of cultural romance. In the 14th century, Geoffrey Chaucer in The Canterbury Tales used springtime for a very different purpose. Caught up in an age of growing ferment that would lead two hundred years later to unthinkable paradigm shifts, Chaucer chose the annual pilgrimages to Canterbury as a literary device to present a slice of life about his world. In the Prologue to the Tales, Chaucer introduces us to diverse and unseemly characters. Some of them, by our standards, were far from individuals whose lives we would emulate. However he raised them up as literature --- in other words, as a mirror in which we can look and wonder if we see a part of ourselves. Like all good literature, Chaucer as author reflects what “is” in the hope that his readers will yearn to be something “more.” Unlike Chaucer’s characters, our authors and their works are extraordinarily savory and very much to be emulated; but the sting of the mirror they offer us is exactly the same. As we read, perhaps we might be called to reflect and wonder where we are being called to “a’streching and a’changing.” As you turn the pages, know that you are welcome ---- from this Editor’s Prologue to another Pilgrimage, in another Springtime, in another century ---- to the never ending human experience of change and deepening.
Dr. Tim Atkinson
is Director of Research and Sponsored Programs at the University of Arkansas for Medical Sciences. He has worked in the research environment for almost 17 years, but he is new to SRA International. Tim earned a B.S. in Biology from Tennessee Technological University, M.Ed. in Higher Education Administration from Vanderbilt University, and he just recently finished his dissertation and earned his Ed.D. in Higher Education Administration from the University of Arkansas at Little Rock. His research agenda focuses on integrity in the research environment and organizational behavior in the university environment. He has two previous publications in Research Management Review. Tim is also Adjunct Assistant Professor of Higher Education at the University of Arkansas at Little Rock where he is an instructor in Organizational Behavior in Higher Education. Tim has been interested in the images portrayed by U.S. Higher Education in a market economy in higher education news media and electronic media. He has publications forthcoming in Accountability in Research, Research Management Review, International Journal of Applied Semiotics and Semiotica.

Dr. Diane Gilleland
joined the faculty of the University of Arkansas at Little Rock in 2003 and teaches courses in finance, governance, law and policy. Since 1997, she has also served as a Guest Faculty in the Summer Institute for Women in Higher Education Administration at Bryn Mawr College and as a consultant to state higher education coordinating boards and the ministries of higher education in South Africa and Mexico. As the Chief Higher Education Officer in Arkansas, Dr. Gilleland led: statewide reform of mathematics and science education (the Arkansas Math and Science Crusades), designing and receiving a $10 million State Systemic Initiative Grant from the National Science Foundation; the restructuring and transforming of fourteen vocational-technical schools to North Central Association-accredited community and technical colleges; the development of the Arkansas Academic Cost Accounting System; the development of a statewide performance funding formula; and the creation of several new financial aid programs to address strategic needs of the state, including a college preparation incentive program known as the Arkansas Academic Challenge Program and four minority forgivable loan programs at the bachelors, masters, and doctoral level. Dr. Gilleland has also served in various positions of leadership at the University of Arkansas at Monticello, Southern Illinois University at Carbondale, and as Senior Fellow at the American Council on Education and the Institute for Higher Education Policy in Washington, DC.

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Mr. Harold DeMonaco, is a Senior Clinical Associate in the Decision Support and Quality Management Unit (DSQMU) of the Massachusetts General Hospital. The DSQMU is an internal consulting group for the promotion of quality and efficiency in patient care. His areas of interest include technology adoption and promotion. Mr. DeMonaco received his undergraduate degree in Pharmacy from the Massachusetts College of Pharmacy as well as a Master of Science degree in Therapeutics. He has held numerous positions in his twenty six year tenure including that of Director of Pharmacy and Director of Drug Therapy Management for the Hospital and Physicians’ Organization. He has also served as Chair of the Human Research Committee. His currently serves on numerous committees including the Medical Policy Committee, the Clinical Performance Management Leadership and Executive Committees. He currently serves as Co-chair of the Hospitals' “innovations” committee. In addition to his Hospital responsibilities, Mr. DeMonaco is a core editor at Harvard Health Publications, a clinical adviser to the Foundation for Informed Decision Making and was a Visiting Scholar at the MIT Sloan School of Management in 2005 and 2006.

Dr. Greg Koski
In June 2000, at a time of national upheaval in human research, then Secretary of Health and Human Services Donna Shalala created the United States Office for Human Research Protections (OHRP) and recruited Greg Koski, a physician-investigator at Harvard Medical School, to be OHRP’s first director. Dr. Koski gained international recognition as the U.S. Department of Health and Human Services (DHHS) remodeled the nation’s system for protection of human research subjects, moving from a reactive, compliance-focused approach to a proactive, prevention-focused system emphasizing education, performance enhancement and responsible conduct by all parties to the research endeavor — not a “culture of compliance, but rather, a culture of conscience” in human research.

With Koski’s leadership, OHRP and DHHS pursued a “systems approach” to protection of human research subjects; catalyzed the development of private, voluntary accreditation of human research protection for Higher Education and The CASE International Journal of Educational Advancement. He has presented research papers at conferences of the Association for the Study of Higher Education (ASHE), the American Educational Research Association (AERA) Divisions J and F, the Association for Institutional Research (AIR), the Midwest History of Education Society, the Office of Research Integrity (ORI) Research Conference on Research Integrity and the AIR/CASE Research Colloquium.

programs; streamlined and simplified the federal assurance process; expanded education and outreach programs; and implemented a new quality improvement program to help entities engaged in human research evaluate and strengthen their human subjects protection programs. In recognition of his many contributions, Koski was honored with a Superior Service Award by the Assistant Secretary of Health, Department of Health and Human Services “for his tireless commitment to enhancing human subjects protection programs across the country and around the world.”

Upon completion of his leave of absence in December 2002, Koski returned to Harvard Medical School, where he is currently Associate Professor of Anesthesia in the Cardiac Anesthesia Group of the Department of Anesthesia and Critical Care and Senior Scientist of the Institute for Health Policy at the Massachusetts General Hospital. During his 40 years at Harvard, Koski has actively participated in every aspect of academic medicine, including basic research, clinical investigation, teaching, administration and patient care. In 1989, his interest in the protection of human subjects and research ethics grew strongly after joining the Subcommittee on Human Studies of Massachusetts General Hospital, the research ethics review committee originally established by none other than Henry Beecher. As director of human research affairs at Partners Healthcare, Koski was responsible for the ethical and regulatory oversight of human investigation, including protection of human participants in research studies, setting the stage for his recruitment to Washington to head the OHRP.

Dr. Koski’s continuing efforts to promote responsible conduct and professionalism in human research have been recognized around the world. In 2002, he received an honorary Doctor of Science degree from the Albany Medical College in recognition of his contributions to medical science, medical education and medical ethics. He is an Honorary Lifetime Member and currently President-Elect of the Academy of Pharmaceutical Physicians and Investigators, where he is also vice-president for Ethics and Professional Conduct. He is a member of the board of the Association of Clinical Research Professionals. He chairs the Ethics Advisory Board of the National Heart, Lung and Blood Institute’s landmark Framingham Heart Study, and is a member of the National Executive Committee of NHLBI’s SHARe genomics initiative. He is a member of the advisory board of the newly established Center for Information and Study of Clinical Research Participation, and chairs the advisory board of the World Health Organization’s Strategic Initiative for Developing Capacity for Ethical Review. He serves on the editorial boards of several journals, including IRB: Human Research Ethics and Accountability in Research and most recently, was named Associate Editor of the new Journal of Empirical Research on Human Research Ethics (JERHRE). An avid cyclist and outdoor enthusiast, Koski resides in Holliston, MA with his wife, Linda Powers.

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**Mr. Scott Rutherford** currently works at Imperial College London, UK, as Research Systems and Information Manager. His key responsibility is to manage the development of research system and information strategies across faculties within the College. His experience spans over eight years within the research administration environment, working for both government funding bodies and within the Higher Education sector. He has worked in a number of roles within research administration, in latter years developing significant experience of project managing and implementing both pre and post award research systems. Scott holds a Bachelor of Arts degree in English from the University of Keele and is currently studying for an MBA at Imperial College London.

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David has previously worked in the private sector (project management/systems engineering), the National Health Service (in clinical oncology research) and as a Fulbright Scholar where he undertook postdoctoral research at the NIH. He has a PhD in neuropharmacology and is currently a Director of The British School of Osteopathy, London and is a member of on the UK Clinical Studies Advisory Group of the Diabetes Research Network.

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Dr. Jacqueline Merrill is an associate research scientist and member of the public health informatics faculty in the Department of Biomedical Informatics, Columbia University College of Physicians and Surgeons. Dr. Merrill is an experienced public health nurse and public health services researcher. She completed a doctorate in nursing science with a concentration in public health informatics at the Columbia University School of Nursing. Her current research takes a complex systems approach toward understanding public health organizational processes by applying dynamic network analysis, a quantitative, descriptive technique for modeling organizations as interlocking informational networks. At Columbia she partners with researchers at the Mailman School of Public Health and the School of Nursing, where she is a member of the Center for Health Policy. She is the recipient of a 2006 Pfizer Public Health Scholar Award and a Public Health Systems Research Award from the Robert Wood Johnson Foundation. She continues to collaborate with the Center for Analysis of Social and Organizational Systems (CASOS) at Carnegie Mellon University to develop a validated network analysis technique specific to public health practice that can be used as a source of infrastructure documentation for system-wide planning.

Dr. Kathleen Carley received her doctorate from Harvard in Mathematical Sociology and is currently a full professor in the Institute for Software Research International in the School of Computer Science at Carnegie Mellon University. Her research combines cognitive science, network science and computer science to address complex social and organizational problems with a focus on generating applied solutions. She and her lab have developed infrastructure tools for analyzing large scale dynamic networks. The infrastructure tools include ORA, a statistical toolkit for analyzing and visualizing multi-dimensional networks; AutoMap, a text-mining system for extracting semantic and social networks from texts; and BioWar a city-scale dynamic-network agent-based model for understanding the spread of disease and illness due to various loss of life events such as pandemics.

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Mr. J. Michael Slocum is a senior member of the law firm of Slocum & Boddie, P.C. He has more than thirty years of experience in grant and contract law. He is a Distinguished Faculty member of the Society of Research Administrators, and has won the Excellence Award (2003) and the Hartford/Nicholson Award (1992) from that organization. Mr. Slocum is an honor graduate of DePauw University, and received his J.D. with honors from George Washington University National Law Center. He is a member of the Virginia State Bar, and is President of Slocum & Boddie, PC in Springfield, VA.

Ms. Marcia Landen has been a research administrator for more than 20 years. Currently she is the executive director of the preaward office at Indiana University, with responsibility for proposal submissions, award negotiations and acceptance, and staff management. She has also worked in the sponsored program development area. With a particular interest in professional development and leadership in research administration, she regularly presents conference sessions on these topics. Marcia is an active member of the Society of Research Administrators International and has been selected as one of SRA’s Distinguished Faculty. She has received the Society’s Hartford-Nicholson Award for service to the Society, and has also served as the president of the Education Division and SRA Secretary. She and her partner are frequent consultants in the area of proposal development. Marcia earned her bachelors degree from Bowling Green State University and her masters from Ithaca College, both in the communications field. She also holds a certificate in nonprofit management from the School of Continuing Studies at Indiana University.

Dr. Victoria Molfese is the Ashland/Nystrand Chair in the Department of Teaching and Learning at the University of Louisville and is the Director of the Center for Research in Early Childhood. She received her Ph.D. in Developmental Psychology from The Pennsylvania State University. She has published journal articles, books, and book chapters in the area of cognitive development in infants, children and adults, and received grants in support of research activities, including an NIH funded longitudinal research grant on electrophysiological and behavioral predictors of language and cognitive development in children from birth through age 13 years. Additional grant funding was received to study the development of reading and mathematical skills in preschool children, the impacts of a mathematics intervention for high-risk preschoolers, the development of personality in twin infants and their parents, and to study the impacts of sleep disturbances on children’s behavior. She is a past-president and past-secretary of SRA International and a current member of SRA’s Distinguished Faculty.
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Mr. Joe Cervelin
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Ms. Lynne Chronister
Dr. Elliott Kulakowski
Mr. Paul Waugaman

Voice of Experience (VOE)
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The Challenge of Public Service

The Dimensions of Influence on Research Administrator Behavior: Toward a Theoretical Model of Research Administration as a Public Service Profession

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Authors’ Note
This literature synthesis on the professions was derived from the author’s dissertation study entitled, “The Institutional Construction of Professional and Corporate Norms in the United States University Research System,” which was completed in the fall of 2006.

Abstract
As the Society of Research Administrators International enters its 40th anniversary, it will become necessary to critically evaluate the state of the research administration profession to chart new directions and new ideas, and to solidify our educational, professional and scholarly agendas for the future. What follows is a critical synthesis and evaluation of 20th century thought on the sociology of the professions, with integration of research administration characteristics as a public service profession. It is suggested that we establish a modern theoretical model. The model proposed is not the final one by any means, but this evaluation situates research administration in the overall study of the professions, providing an important theoretical stronghold.

Introduction

Problem Statement
Very few empirical studies have been done on research administration. In 1986, Hensley noted, “it is widely acknowledged that research support personnel are essential…to the achievement of the specific missions of postsecondary institutions, and to American technological leadership, yet this vital group’s value to science is largely unrecognized in comprehensive studies; and the field is generally ignored by disciplinary associations in their assessment of the...
science and academic infrastructure” (pp. 47, 48). Hensley’s statement holds true in this century, over 20 years later; with the emergence of the study of research integrity as a scholarly field, it is of vital importance that research administrators define a scholarly model to follow for development, or some other group will define it for us. It is suggested that we establish a modern theoretical model that situates research administration in the overall study of the professions and provides an important theoretical stronghold.

It was not until Roberts (2005) set out to study the perceptions of research administrators toward certification that empirical research design and data collection were applied to research administration professionals. In 2006, Atkinson performed another empirical study on research administrators to determine their overall normative and professional orientation with regard to research integrity issues. The former was a microanalysis; the latter focused on a systemic, or macro-level, analysis. These kinds of studies are good for the profession, and more are needed.

In the recent history of western civilization, the idea of “profession” has expanded beyond the mediaeval constructs of doctor, lawyer, clergy, and professor. Organizational expansion and institutionalization have effects on behavior that cannot be ignored. Students of organizations recognize two groups, (1) governmental units and (2) professional groups, as responsible for developing rules and regulations for managing and shaping the institutional environment (Scott, 2003). DiMaggio and Powell maintained in 1983 that the professions had become the 20th century thought leaders in organizations, serving to shape and change their organizations. For the most part, these effects have not changed.

University research administration’s behavior is influenced by the entire process of professionalism, making research administrators the thought leaders in the management of research. Goode (1957, 1961, 1969) envisioned this process on a “continuum.” Institutional scholars often refer to this as the professionalization process, which helps establish legitimacy and power. Previous studies of professionalism in higher education administration have demonstrated that comparing a university-based professional group along the continuum of professionalism provides much needed information to establish an academic assessment of the group’s professional behavior, status and legitimacy, both in society and within the university organization (Braxton, 1992, 1999; Bray, 2002; Caboni, 2001). However, as Abbott (1988) contended, the continuum alone is not solely responsible for the behavioral foundations of a profession. The wider organization and the linkages of the profession to other organizational contexts must also be taken into account.

History of the Study of the Professions

Goode (1957, 1961, 1969) might have placed research administration in the class of semi-professions, where protecting the client base was of utmost importance, but the intimacy between the professional and the client appeared diminished or distant. According to Abbot (1988), Bucher and Strauss (1961), Harries-Jenkins (1970) and Wilensky (1964), research administration is a profession positioned within a complex university organization, in a complex research system.

On an historical note, research administrators were installed in universities to rationalize and formalize the demands
of the federal government, private industry and philanthropic organizations. But as research universities grew and the influx of external funds increased, so did research administration’s responsibility for making sense of the increasing burden of regulatory requirements. Research administrators found themselves in an open organizational environment, where monetary and information exchange occurs within many different contexts (Kalas, 1987).

The literature of the professions followed its own developmental process, with relevant themes surfacing and evolving along the way. The modern professional continuum includes, but is not limited to, medicine, law, (Abbott, 1988; Carr-Sanders & Wilson, 1964; Goode, 1969), the clergy (Carr-Sanders & Wilson, 1964), the professoriate (Braxton, 1999) and other emerging or semi-professions, such as accountancy, nursing, dental hygiene, social work (Abbott, 1990; Greenwood, 1957), university fund raising (Caboni, 2001) and Deans (Bray, 2002). Research administration should consider itself along this continuum, within and among the vast family of professional groups.

The study of the professions is a sociological discipline with a varied but interesting history. The late 20th century literature is steeped in a classification approach. Sociologists believed that the educated professions were responsible for holding society together because of their education and status. In the 1980s and 1990s, it became apparent that a systems perspective was necessary to balance the classification approach, given that organizations and organizational systems also affect the professionalization of many occupations, including those referred to in the literature as “free” professions, such as medicine, law, and the clergy. These works defined what constitutes a profession in modern society, both in the United States and Europe. The body of literature in the sociology of professions offers suggestions for areas of study in the field, and suggestions concerning which characteristics are most important for defining a profession.

Scholars regularly identify the comprehensive work of Carr-Sanders and Wilson (1933), a qualitative case study that served as a foundation for identifying the initial characteristics of the professions. Parsons (1939), Goode (1969), and Harries-Jenkins (1970) are also cornerstone works in the sociology of professions, particularly with regard to the characteristics of the “American” linear professional continuum. Carr-Sanders and Wilson (1933) outlined a general framework for the study of professions in the United Kingdom, listing an eclectic mix of professions starting with lawyers and doctors and ending with authors, artists and brokers. Some of the more interesting professions studied were midwives, masseurs, mine managers, and biophysical assistants. The purpose of their study was to review various occupations that claimed the title profession and those occupations that adopted some of the notable characteristics of the ancient professions. Carr-Sanders and Wilson used a well bounded qualitative case study approach. The themes resulted in a somewhat consistent set of parameters that have been used to characterize professions to the present day.

Carr-Sanders and Wilson discovered that the term profession holds different meanings for different occupational groups; to draw an arbitrary line between professions and non-professions would have only increased the complexity of the study of professions. This view appears to be firmly held into the present day. Carr-Sanders and Wilson also suggested that professionalism is best regarded as a professional matrix made up
of a myriad of professional characteristics. The “ancient professions” of lawyers and doctors, for instance, landed in the center of the matrix while all the other occupations landed in and around the center, depending on the number of professional characteristics the occupation expressed (Carr-Sanders & Wilson, 1933). The matrix view appears to have been proposed prior to the linear continuum model adopted later by American sociologists, particularly Greenwood (1957) and Goode (1957, 1961, 1969). Nonetheless, these works illustrate how the professions, regardless of their relevant position in society, land somewhere on the professional matrix or continuum. Social status is determined tacitly by society and not necessarily by the position the occupation holds in the matrix itself.

The prominent themes that emerged in the Carr-Sanders & Wilson study were that professions are typically characterized by: (1) long-term and specialized training, such as certification programs and continuing education programs; (2) service to the community, such as educational seminars on topics of specialization; (3) honor codes, such as a professional code of ethics; (4) establishment of professional associations, such as the Society of Research Administrators International and the National Council of University Research Administration; (5) control of access to the field, such as an entrance exam or bar exam; (6) a specialized body of knowledge, such as law or medicine; (7) and an acknowledgement that occupations within bureaucracies (or public life) can be considered professions to a certain degree on the matrix.

Also, it is important to note that Carr-Sanders and Wilson spent a considerable amount of time studying the significance of a profession’s relationship to the public, and the responsibilities that go with it.

This notion is relevant because research administrators have a responsibility to protect an extremely broad client-stakeholder base. Although Carr-Sanders and Wilson might have disagreed that research administrators have a direct responsibility to the public, the United States taxpayers actively provide funding, and research administrators are obligated to be good stewards of these funds.

Parsons (1939), an American contemporary of Carr-Sanders and Wilson, appears to have been one of the first of the prominent sociologists to demonstrate the importance of the behavioral process of the professions within the entire social structure. Parsons was very interested in the motivation behind the people in the professions, and studied whether these people were self-serving or truly dedicated to service without self-interest. Parsons was concerned with human action and the struggle between egoism and altruism. For instance, businessmen have often been associated with the ego and professional men (doctors and lawyers) with altruism, but Parsons felt it was difficult to separate altruistic behavior from selfish motivation because, after all, the professions command more compensation than other occupations.

Although not stated explicitly, Parsons did not deny the philosophical frameworks of the social influences on a profession’s behavior. He noted that rational behavior is affected by day-to-day patterns of interactions; these patterns were not necessarily a single human function, but the function of society’s nuances. He contended that the professions are under “subtle social pressures” to behave a certain way or “ways and means” (p. 459).

The relevant themes to emerge in Parsons’ work were that professions; (1) are controlled by social control mechanisms
and technical competence for the sake of the client; (2) act on a certain level of authority afforded by society, (3) typically have a high level of specialized technical competence; (4) are considered professional in a bureaucratic structure, in the sense of power and authority wielded over others within the organization and within society and, therefore, must carry some level of social control; and (5) must sacrifice their own needs for the sake of the client’s needs, no matter who he or she may be. The themes at this stage of the literature begin to take form with some overlapping identifiers, particularly with regard to the development of the factors that comprise the professional “ideal of service” (Goode, 1969).

Greenwood (1957) noted that a profession is an organized group that functions continuously in society on an “informal or formal” basis and forms its own subculture within the larger society. With this comes the responsibility of self-regulation. Greenwood noted five themes of the professions which appear to have been a distillation of Parsons’ notion of professionalism: (1) a systematic theory, (2) authority, (3) community sanction, (4) ethical codes, and (5) a culture. These characteristics serve as a litmus test for demonstrating a profession’s position within the system. The study of research administrators must also consider these parameters because research administration possesses all five of these attributes.

Greenwood (1957) seemed to agree with the Carr-Sanders and Wilson (1933) determination that clear-cut classifications were a near impossibility and that occupations exist on a continuum. Greenwood appeared to be the first to propose the linear continuum that placed the prominent, highly skilled professions at one end, with the lesser-skilled occupations relegated to a lesser scope of contribution. It is interesting to note, too, that Carr-Sanders and Wilson envisioned a professional matrix or sphere, while Greenwood equated skill with social class.

Relevant to the study of research administration is Greenwood’s (1957) discussion of codes of ethics, which he said are “explicit, systematic, and binding [and] possess more altruistic overtones and are more public service oriented” (p. 51). Parsons also mentioned professional codes, and Greenwood further noted that professional associations influenced the members of the profession. Research Administration has followed this path. There are two prominent professional associations governing the practice of research administration, the Society of Research Administrators International (SRA) and the National Council of University Research Administrators (NCURA).

Goode (1957) set out to define the theoretical limits of professionalism for a research agenda, and appears to have had the greatest impact on the field of the sociology of the professions in the later years. Goode was concerned with the relationship between “contained communities” and the larger society, noting that professions were in and of themselves small communities that can have an effect on the larger society. The contained community that the research administration subculture follows is within the complex university organization set in the inseparable research system. Goode was most concerned with (1) “socialization and social control, and (2) client choice or evaluation of the professional” (p. 194), both of which are relevant to a study of research administration given the broad client base and the stakeholders involved.

Goode (1957) noted that the “community of profession” is characterized by: (1) a collective sense of identity, (2) a very low attrition from the practice, (3) a sharing of
a common value system, (4) an established set of roles, (5) a common esoteric language, (6) power over other members, (7) limits that are primarily social limits, and (8) strict monitoring of the entry of members into the community. Vaughn (1990) later asserted that these characteristics also carry with them the characteristics of isolation, monitoring, and masking of control. To explain this further, he noted that the Challenger disaster was marked by a lack of information sharing between professional groups.

Goode (1957) also contended that society as a whole tends to create the need for a specific profession. For instance, he asserted that increased industrialization resulted in the need for a new set of knowledge and skills, and that communities developed around these needs. Applying this approach to research administration, if a societal field becomes research-oriented, it depends increasingly on professional skills centered on the management of research. Given this specialization of knowledge, the professions have an opportunity to take unfair advantage of the larger communities in which they function, but one of the hallmarks of professionalism is the denying of self for the sake of the common good. Philosophically, this does not mean that professionals are typically more virtuous than non-professionals, but as Goode noted, the attitude toward exploitation serves to increase or decrease the status of the profession as a whole. During the socialization process of the most prominent professions, Goode said, new recruits are informed of the punishments or sanctions that would befall non-professional behavior.

Goode’s (1957) work is defined by the importance of larger societal influences as well as the influences within the professional community: “[I]n its bid for respect from the larger society, the professional community must justify each provision in its [formal or informal] code of ethics or etiquette by invoking ethical notions that are also accepted by the larger society, even when certain provisions seem to the lay eye at least potentially exploitative” (p. 197). Professional bureaucrats, however, are controlled by the bureaucracy, the larger society or system, and professional associations. Advancement and prominence are directly proportional to the level of professional behavior and success.

In 1960, Goode expanded his eight-point professional continuum to 10 points to address the aspirations of psychologists and other emerging professions to be recognized as professions. He noted that specialization is a process by which a profession must: (1) determine standards of training, such as certification councils; (2) possess an extensive socialization process, such as medical or law school; (3) possess a licensure process, like the bar exam or medical exam; (4) control the licensing of members of the profession, such as a state board of medical licensure; (5) shape legislation by members of the profession; (6) increase prestige to the best students, such as strict admissions processes; (7) be free of lay control; (8) have a set of norms enforced by the profession; (9) have members who identify strongly with the profession, and (10) have the characteristic of long-term service in the profession by members (in particular, medicine).

Clearly, the literature focused on socialization, referent group expectations, and society’s needs. Goode (1960) noted that all these characteristics are dependent on one another, and each serves to benefit the client and the profession. Inherent denial of self-interest or disinterestedness was developed as the cornerstone perspective of professionalism. The development of the professional continuum by Goode was in...
flux at this stage, but by calling attention to the interdependence of the traits, Goode set the stage for further distillation of the traits, which all appeared to have socialization as the underlying construct of the transmission of professional behavior to the rest of the group and into the organizations in which they work.

The literature on professions reached new maturation when Etzioni (1969) set out to extend the sociology of professions among some “new” or emergent professions. The use of the term semi-professions -- with no apologies toward those who might belong in a semi-profession -- was coined as: “A group of new professions whose claim to the status of doctors and lawyers is neither fully established nor fully desired” (p. v). Scholars at this stage appear to hold tight to their classification and class notions. Etzioni admitted that by introducing study of the semi-professions, by default, one must consider the organization and its environment. As a practical matter, most of the semi-professionals he studied were employed by some kind of organization. By classifying these as “semi-profession” and their position within society, Etzioni highlighted the fact that organizations cannot be ignored in the development of behaviors among professions themselves. He maintained that some of the semi-professions that aspire to the status of physicians would never achieve that status because they lack strict controls to the entry of the professions and many do not stay in the field as long as physicians. Etzioni’s approach is extremely rigid. It is not suggested here that research administration should control the entry and exit of members. A study should first be done to determine if people believe this would damage research administration or help it.

Goode (1969) contributed to Etzioni’s discussion, and proposed the theoretical limits of professionalization. It is here that Goode distilled his prior work on professions into two “generating” traits: (1) professions possess a basic body of abstract knowledge and (2) professions profess an ideal of service. Society and its organizations influence the ideal of service within a professional community, and that ideal of service should naturally be geared toward protecting those served. As discussed in the institutional context, this concept includes what have come to be known as stakeholders.

Academic life supports skepticism; the study of professionalism did not go without effective criticism. Bucher and Strauss (1961) theorized that classifying professions and their “fit” into society relative to class was limited. Wilensky (1964) argued effectively in their favor. Moore (1970) proposed that dividing occupations into the category of “professional” and “non-professional” is too “rigid in view of otherwise interesting ranges of variation” (p. 5). Abbott (1988) synthesized the study of occupations and personnel into a systems approach, again bringing in the inescapable organizational factor.

Bucher and Strauss (1961) proposed a study of the professions that more closely resembles a process. Their work led to a call for more study into the “arenas,” or organizations, as an important area of the professions: “[organizations or institutions] constitute the arenas where [professional] roles are forged and developed” (p. 333). In other words, professions do not work in a vacuum but must be molded by the influence of organizations and society, and this serves to develop different specializations and different segments within the profession, each with different sets of parameters. The elements of specialization are important to the study of research administrators, both because of the complex organization within
which they work and because of the complex environment with which they interact. Research administrators have begun segmentation into pre-award and post-award specialists, institutional review board and compliance administrators, technology transfer officers, and contracts negotiators. Also, as professions become specialized and segmented, the fate of a person’s career or occupation is explicitly tied to the professional segment (Bucher & Strauss, 1961).

Indeed, Wilensky in 1964 predicted that future studies of professionalism would have to take into account the lives of professionals working in organizations. He concluded that the notion of an “ideal of service” belonging to an exclusive class was a “sociological romance.” On the other hand, he asserted the importance of following professional norms, noting that administrators must naturally increase their “professional” competence and standards. Moore (1970) commented that professionalism was a phenomenon of modernization and economic growth. He seemed to reduce the study of professionalism to a kind of legitimization strategy more than a classification scheme, but it was nonetheless a way to achieve increased status in society -- a view held strongly by others (DiMaggio & Powell, 1983, 1991; Myer & Rowan, 1977, and Scott, 2001, 2003).

Moore (1970) noted:

Just as representatives of occupations seeking enhancement of collective status have devoted much time and energy to the enterprise, so academic scholars have devoted uncounted hours to the definition and characterization of profession. Neither form of activity can be dismissed out of hand as entirely wasteful or inconsequential, though some of it undoubtedly is. (p. 4)

By this measure, Moore set out to demystify the classification method as the sole method of studying the professions. Classification methods, it seems, were beginning to lose favor among scholars. Moore proposed that professions progress along a scale rather than a continuum of attributes because the mere attainment of attributes is not an entirely accurate test to apply to a human being who might hold some inherent virtue. In other words, “professional” acting people work in certain occupations that might not be considered professional on the continuum or matrix; yet, these individuals exhibit more professional behavior than some individuals who actually do occupy certifiably distinct professions. Echoing Bucher and Strauss (1961), Moore (1970) suggested that scholars focus equally on the professional process so that the particular “strategies” toward attaining professional status are not ignored. This is a classic example of a scholar making sure all of the variables are accounted for so that the picture of reality is not skewed one way or the other.

Moore’s (1970) professional scale, therefore, followed a more inclusive pattern: (1) professionals are full time workers, and this work is the sole source of income; (2) professionals are distinguished by distinctive good behavior; (3) professionals create professional associations; (4) professionals have specialized training; (5) professionals have a definite service orientation; and (6) professionals are distinguished by autonomy. It is important to note that Moore did not believe that these traits had equal value and that many occupations exhibited these traits in one form or another along his scale.

Moore (1970) noted that having a set of norms is a distinguishing factor in and of itself, and society notices these norms whether they are formal or informal. These boundaries exist and influence behavior both inside and outside the profession,
whatever occupation it may be. In other words, the professionalization process most likely creates in each member of the profession a special identity, and this sense of identity is at its most powerful when professional associations gather to discuss the concerns of their field. Moore provided a turning point in the study of the professions, urging scholars to stop creating the perfect classification scheme and to begin understanding the mechanisms involved in becoming a “professional” actor in society. As for the study of professions within organizations, Harries-Jenkins (1970) stated:

The professional of today is often a salaried employee, performing his activities within the structural framework of a bureaucratic hierarchy, in occupations as diverse as teaching, government, social welfare, medicine and industrial management. [H]e participates in two distinct, irreconcilable systems. He is a member of two institutions – the profession and the organization. Each attempts to control his occupational activities, and the manner in which the former establishes the norms for the conduct of the professional activities, contrasts with the way the latter specifies task objectives. (p. 53)

Abbott (1988) noted that the term “profession” had lost much of its glamour in the literature, with signs that inclusiveness and postmodern thought had begun to weaken studies focused specifically on social status and social structure. Although these notions are still important, the term profession has come to mean more of a mode of behavior than an occupational status. Abbott urged scholars to probe the “system of professions” and transcend some of the rigidity brought on by earlier approaches. In other words, just about any occupation can be a profession within the system at a given point of time. The conditions of professionalism are contextual. Research administration does not need to prove its professional status, but simply understand how its professional mode of behavior is connected to its institutional system. As Abbott stated, “History is not a simple pattern of trends and development, but a complex mass of contingent forces” (p. 316).

Conclusions
The word “professional” has come to mean something more than doctor, lawyer, or professor. Professional means working within a defined field of knowledge with an attitude toward protecting the individuals who are dependent on the professional’s expert knowledge, clients and stakeholders. Expert knowledge is derived within the organization and organizations like it in the same business. Specialization promotes expert knowledge within the profession and within an organization. As we have seen, protecting the knowledge and the client are hallmarks of a true professional. Professional ethics, therefore, is an intrinsic characteristic of all those who would call themselves professional. With this specialization comes a diffusion of behaviors within the organization’s organizational chart and outside the chart down to the level of human-human interaction. The literature concerning the sociology of professions answered this question very well and brought the organization back in. This is satisfying to the institutional theorist who has fundamental problems with studying a group as if it were isolated from the influences of the rest of society. Physicians and attorneys, the classic professions found in “private practice,” are influenced by factors in the broader society even when these professionals operate apart from a complex organization such as the
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university. Managed care has demonstrated its effects on professional behavior. After Abbott (1988) urged sociologists to move beyond the study of professions in isolation, empirical studies seem to wane or lose favor among sociologists as indicated by the lack of any new studies in the major publications. Perhaps research administration should revisit these theories for solid grounding.

**Figure 1. The proposed model of research administration normative behavior. (Atkinson, 2006)**

Figure 1 brings the organization and its environment back in to thinking about research administration. An explanation of these dimensions is presented in Table 1. The model proposes that factors in the research environment, the institution, and the professional associations dictate how research administrators respond to issues. In turn, a simple behavioral structure emerges that demonstrates the overall organizational structures encountered as research administrators perform their role. The model is comprised of elements in the organization’s operating environment and the professional group, all acting to produce a behavioral structure. DiMaggio and Powell (1991) noted that this is a continual process of becoming like-minded, where the environmental factors and the professions behave the way they behave and eventually the whole group acts this way without any noticeable effort. The organizational influences are those day to day organizational structures, such as bureaucracies, formal lines of authority and rules and regulations (Scott, 2003). Natural systems are also at play in the organization, which is where we create our own goals by meeting together, examining our own desires and needs, even if these desires counter the desires of the rest of the organization. It is within this natural system that innovation occurs, expanding the boundaries of the university, allowing in the culture, informal norms, networks, and differentiated goals, all serving to construct the norms in the environment (Scott, 2003). These processes are illustrated by Table 1.
Table 1. The Dimensions of Influence on Research Administrator Behavior (Atkinson 2006)

<table>
<thead>
<tr>
<th>Institutional Environment (Complex Research System)</th>
<th>Variables</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organizational Influence on Behavior</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rational Social Structures</td>
<td>Authority systems, hierarchies, routines</td>
<td>Conformity to the principles, policies and procedures of the organization.</td>
</tr>
<tr>
<td>Natural Systems</td>
<td>Values, expectations</td>
<td>Conformity to the informal expectations of the organization.</td>
</tr>
<tr>
<td>External Influence on Norms (Sponsors and Community)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boundary Spanning</td>
<td>Protection of organizational boundaries.</td>
<td>Respect for the organization’s boundaries during negotiations.</td>
</tr>
<tr>
<td>Stakeholders</td>
<td>Response to external demands.</td>
<td>Respect for sponsor’s boundaries and demands during contract or grant negotiations.</td>
</tr>
<tr>
<td></td>
<td>Responsibility to protect individuals in the organization’s realm of influence</td>
<td>Respect for community research participants and the research sponsors.</td>
</tr>
<tr>
<td>Professional Group (University Research Administrators)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideal of service</td>
<td>Responsibility to clients/stakeholders</td>
<td>Duty to protect internal and external clients.</td>
</tr>
<tr>
<td>Specialized knowledge</td>
<td>Control of normative processes</td>
<td>Duty to communicate rules and regulations both internally and externally and changes to those rules.</td>
</tr>
<tr>
<td>Codes of ethics/principles</td>
<td>Ethical responsibility to the organization and society</td>
<td>Duty to avoid conflicts of interest. Duty to represent the institution accurately.</td>
</tr>
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</table>

At the same time, there are external influences constructing norms (Pfeffer & Salancik, 1978, 2003). The organization expands its boundaries, examines expectations of stakeholders, and finally makes decisions about whether to adopt or reject these behaviors into the organization proper (Donaldson & Preston, 1999; Scott, 2003). One cannot ignore that the professions are also responsible for creating and communicating behavioral structures in the environment (DiMaggio & Powell, 1983, 1991; Goode, 1960; Moore, 1970). In the end, a model appears that is not the product of any one individual group, but of the combination of all these factors. The outcomes of studies of research administration should be considered to represent some aspects of social obligation, appropriateness, moral governance (Scott, 2003), and in many respects a philosophy of following the norms (Deverterre, 2002).

References


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Crossing the Great Divide: Adoption of New Technologies, Therapeutics and Diagnostics at Academic Medical Centers

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Authors’ Note

Few endeavors are the work of a single individual or of a small group of individuals. This paper is no exception. The thoughts and approaches highlighted are the result of the work of the members of the Innovative Diagnostics Committee, the Medical Policy Committee and senior management of the Massachusetts General Hospital. It is to be noted that this paper was originally presented as part of the 2004 Symposium at the annual October meeting of the Society of Research Administrators International in Salt Lake City for which it was awarded Best Paper of the Year – Second Place.

Abstract

The role of new technology in healthcare continues to expand from both the clinical and financial perspectives. Despite the importance of innovation, most academic medical centers do not have a clearly defined process for technology assessment. Recognizing the importance of new drugs, diagnostics and procedures in the care of patients and in the financial well being of the institution, the Massachusetts General Hospital established the Innovative Diagnostics and Therapeutics Committee to provide consultation to senior leadership. The Committee is composed of senior management, along with selected members of the medical
staff and others, and provides consultation on the appropriateness of new technology adoption. A case is presented that highlights the issues related to asymmetry of information and the Committee’s role in placing an institutional perspective on adoption. Committee methodology is briefly described along with important lessons learned.

**Key Words:**

technology assessment, technology adoption, quality, safety, innovation, innovative therapy

“Technology is dominated by two types of people: those who understand what they do not manage, and those who manage what they do not understand.” –Putt’s Law

**Introduction**

At many academic medical centers, adoption of new technologies can be a chaotic and ill-defined process. Traditionally, stakeholder physicians have decided whether to use new medical technologies on the basis of their patients’ best interests and wishes. Technologic advances in medicine have the capability to enhance diagnostic and therapeutic options, but in doing so will likely increase the cost of health care. In the era of cost-based charging for medical services, the direct costs of new technologies were not borne by physicians or academic institutions, but simply passed on to payers. Fiscal constraints in health care now increasingly force institutions to assess the absolute and comparative costs of what they do, and to balance these costs against their academic and community missions. If adequate means are not available for evaluating outcomes, diagnostic and therapeutic techniques may be used with little outcome benefit and, in some cases, with high cost and harmful impact.

Today, what is best for an individual patient must be considered relative to what is best for other patients, the institution, and society at large. The competition between physicians’ allegiance to their patients and the financial realities confronting society and institutions is increasingly apparent. This tension will likely be amplified by smaller and smaller operating margins in academic medical centers and is already affecting clinical research activities. The unwillingness or inability of premier clinical research facilities to accept technology tested locally may negatively impact the willingness of manufacturers to seek out these institutions as test sites.

A major barrier to a systematic institutional approach to the adoption of innovative technologies and therapeutic methods is what Folland (1997) terms “asymmetry of information.” Folland defines “asymmetric information” as “situations in which the parties on the opposite sides of a transaction have different amounts of relevant information.” Physicians often lack knowledge and understanding of the financial health of the academic institution and of the impact of new technology. Hospital administrators are usually not well versed in patient management issues or in the technologies themselves. This asymmetry of information leads many academic institutions to make decisions about new technologies in a relative vacuum. Politics, emotion, and the eminence of the physician stakeholder commonly replace an appropriate value-based assessment. Much of the tension around institutional adoption of new technology stems from this asymmetry of information.

Discussions concerning asymmetry of information in healthcare decision-
making have traditionally been confined to economists. We believe that this lack of discussion in academic medical centers is counterproductive. Effective technology assessment and adoption requires a balanced and thoughtful review process with information transparency, but such systematic approaches are unfortunately rare.

How then should academic medical institutions contend with new diagnostic or therapeutic technologies? One approach is perhaps best exemplified by a case report concerning new technologies designed to control patient body temperature.

**Case Example**

Clinicians involved in the care of patients who have suffered a form of acute brain injury called subarachnoid hemorrhage (SAH) have known for some time that fever is a prognostic indicator of a poor outcome. SAH involves the abrupt rupture of blood vessels in the brain, usually from a ruptured aneurysm, and bleeding into the space between the membrane covering the brain and the brain itself. Some 10 to 15% of patients suffering from SAH will die before reaching the hospital. The mortality rate in the first week of hospitalization approaches 40%.

If the patient survives the event, a second critical juncture is reached some days later. Although the cause is unclear, some patients suffer an acute constriction of blood vessels (called vasospasm) in the vicinity of the original bleeding. The vasospasm can cause stroke and additional brain injury or death. Clinicians have seen a link between the development of vasospasm in patients and the presence of a fever. The presence of fever appears to be a predictor of poor outcomes in patients with SAH.

For many years, clinicians have sought to reduce or prevent fever in an effort to reduce the risk of vasospasm. Experimental animal models have demonstrated improved outcomes when cooling methods are employed. Various methods have been studied and are used clinically. Surface cooling methods have included alcohol wipes and cooling blankets. Research continues into the use of more sophisticated devices to achieve surface cooling. Inner core cooling methods have included the insertion of “refrigerating catheters” into large blood vessels. Although several surface and inner core devices have received approval for marketing by the Food and Drug Administration (FDA) on the basis of clinical research, no device has been shown to alter patient outcomes to date. The devices are expected to cost $350-650 more per patient than cooling blankets. Is this a technology that should be adopted by academic medical centers?

**The Physician’s Role**

The physician’s role as the patient’s primary advocate is defined historically and by professional standards. The American Medical Association (2005) clearly defines this advocacy role in a policy statement. The policy also notes that physicians are not rationers of care, but “…will continue to utilize diagnostic and therapeutic measures and facilities in the best interest of the individual patient.” This clearly delineated role would appear, at face value, to be in potential conflict with institutional and administrative desires for cost containment.

It would be somewhat naïve to assume that the additional interests of the clinician researcher do not introduce yet another layer of complexity. Academic and financial conflicts are well documented in this regard. In this context, supplier-induced demand for a new technology may drive or be driven...
An Institutional Response

Academic medical centers have numerous constituencies, all of whom have parochial but reasonable expectations. The tripartite role of academic centers of clinical care, teaching and research are the traditional framework for the institutional expectations. Patients have reasonable expectations for appropriate clinical care while societal expectations also include teaching and research. Physicians reasonably expect to be able to manage patient diagnostic and therapeutic interventions without unnecessary infringements. Beginning in the late 1980’s, however, a new stakeholder, third party payers, placed additional and seemingly contradictory demands on academic health centers. Cost containment has been the major concern for the majority of these payers. Academic medical centers now face a multitude of seemingly contradictory goals and objectives, fostered by the expectation that all of these activities will be conducted with appropriate fiscal responsibility in the face of increasingly constrained resources. This new paradigm has the potential for creating discord within the community and threatens the academic and social missions of academic medical centers.

That technology should bring value is not a new concept except perhaps in healthcare. The traditional value equation (Value = Quality/Cost) is transparent in most industries. Healthcare is remarkably different however. Healthcare value, like beauty or pornography, is in the eye of the beholder. Clinicians, patients, insurers and hospital administrators may have remarkably different views of exactly what value a new technology brings to the provision of care.

Recognizing that there is an asymmetric understanding of new technology, that the decision-making process is not transparent at most institutions, and that there is a growing need for a systematic approach to technology assessment and adoption, the Massachusetts General Hospital established the Innovative Diagnostics and Therapeutics Committee (IDT) in 1999. Although the hospital has for nearly thirty years had policies and procedures in place for bringing innovative diagnostic and therapeutic methods to the research domain for appropriate evaluation, no consistent or systematic process existed for informing and overseeing the actual adoption of these methods or new technologies into clinical practice. The creation of the IDT committee was intended to facilitate this process.

The IDT committee is charged with the responsibility of formally evaluating new diagnostic and therapeutic technologies for “quality, safety and efficiency.” It is a permanent, standing subcommittee of the Medical Policy Committee and acts in a consultative role to senior management for technology adoption. The committee is also charged with ongoing monitoring of new technology use. Membership is detailed in Table 1. Senior level administrators as well as key stakeholders from the institutional review board (IRB), research administration, biomedical engineering, and medical staff are included. Legal counsel is available and the committee has a medical ethicist member.
A key element in the committee’s ability to identify and assess new and emerging technologies and therapeutics is the presence of members from the hospital’s research community. Membership of two IRB chairs is intended to provide the committee with a “view over the horizon” into emerging technologies. This perspective allows the committee to identify technologies early, and in many cases during clinical trials. It also allows new and existing technologies to be compared to emerging technologies of the near future. The committee seeks an assessment of the clinical attributes and administrative impact of the technology. Of note, the clinical assessment must also detail the social, political, and ethical impacts of the proposed new technology.

**Committee methodology**

The committee methodology includes active and lead participation by the clinical stakeholders. Members of the hospital’s Decision Support and Quality Management Unit staff the committee, and provide analytic support for technology stakeholders.

These members, with a committee co-chair, support clinician stakeholders in preparation for presentations to the IDT. The stakeholder is the actual presenter. Technologies discussed to date have included laboratory tests, new interventional cardiology techniques, drugs and surgical procedures.

The IDT review process involves a standardized assessment of the institutional impact of the proposed new technology. The assessment is conducted with the active involvement of the clinical stakeholder and involves a community-based assessment that crosses departmental and institutional boundaries. A brief description of the domains of interest is noted below:

**Clinical Assessment**

*Is it safe and effective?*

The initial task in determining safety and efficacy is the development of standardized definitions for the technology under consideration. While improvement in patient outcomes is the desired definition of effectiveness, surrogate measures may

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**Table 1. Committee Membership**

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<tr>
<th>Chief Medical Officer</th>
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<tr>
<td>Medical Ethicist</td>
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<td>Legal Council (ex officio)</td>
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<td>Senior Hospital Management</td>
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<tr>
<td>Chief Financial Officer</td>
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<td>Patient Care Services/Chief Nurse Executive</td>
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<td>Research Administration</td>
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<td>Biomedical Engineering</td>
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<td>Medical Staff</td>
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<tr>
<td>Institutional Review Board</td>
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<tr>
<td>Institute for Health Policy</td>
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<td>Center for Integration of Medicine and Innovative Technology</td>
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</table>
be used out of necessity. Most devices are examined during clinical research without intent to determine changes in patient outcome. As a result, the true value of the technology is indeterminate. In the case of patient cooling technology, the devices are safe when used appropriately. Their effectiveness, however, is a matter of debate. In most cases, new technologies are approved for marketing by the FDA solely on the basis of safety and effectiveness in achieving a specific clinical effect. For example, in the case of cooling devices, the FDA assessment is based on one primary measure: the ability to safely reduce body temperature. Accordingly, many new technologies may be FDA-approved and introduced into clinical practices long before their ability to improve patient outcome is established. If effectiveness is defined as the ability to alter body temperature, cooling devices meet the requirement. If, however, effectiveness is defined in terms of reducing patient morbidity or mortality, the devices have not been demonstrated to be effective. The designs of clinical studies submitted to support FDA approval are often inadequate to demonstrate clinical effectiveness by the latter definition, thereby necessitating a more detailed outcome assessment prior to wide-scale adoption.

Is it an improvement over existing technology?

A critical element in the institutional decision to adopt new technology is a comparative assessment. New technologies must provide better value compared to existing technologies or procedures. Unfortunately, information on comparative effectiveness is not always available early in the adoption phase of a new technology. When comparative effectiveness and safety cannot be determined, clinical equipoise must be assumed, and further clinical studies are likely to be necessary to provide sufficient information for this assessment.

Is there an urgent need for the technology?

The degree to which a new technology is embraced is in part related to the clinical need. For example, the value of a new technology in the treatment of a previously untreated illness may be high even if the safety is relatively low or costs are high.

Has the technology received regulatory approval?

As mentioned previously, adoption of a new technology by the marketplace at large usually occurs only after regulatory approval, and such adoption may occur prior to full assessment of clinical effectiveness. Academic medical centers engaged in clinical research are in a unique position of “adoption” prior to marketing approval as a result of participation in clinical trials. Because of this unique position, academic centers should conduct a technology assessment prior to actual market approval. Linkage with the IRB allows the IDT Committee to see technologies just over the “marketplace horizon” and prior to the traditional adoption phase. An important consideration in the acceptance of new technology, even in the clinical research phase, is the institutional acceptance of protocol constraints.

Administrative assessment

What are the social, ethical and political impacts of the technology??

New technology is no longer adopted in a vacuum. Resources consumed as a result of a new technology are not available for other clinical needs. Resources consumed include money, intensive care unit beds, nursing and other profession time, training and access to care. For example, a new
technology that does not alter outcome but prolongs hospitalization may result in cancellation or postponement of care to others. This can have serious and unintended consequences, especially if key resources such as operating room time, intensive care unit beds and nursing personnel are required for care. Technology applied in futile care may injure the patient, the patient’s family, and society at large when applied in a constrained environment. Patient cooling technology may require additional manpower, needlessly consuming scarce nursing resources. In a constrained environment, institutional perspectives must be considered even in circumstances where the technology does alter outcome. How many resources can be devoted to serve a small sub-population of the community to the detriment of others?

How much does it cost?

Prior to the introduction of prospective reimbursement, the cost of new technology was not a major consideration in its adoption. Cost considerations include direct costs of acquisition and operation as well as additional personnel and training costs, and impact on capacity management. The contribution to institutional margins must also be determined.

Will it affect personnel mix?

Shortages exist for several types of healthcare providers, including nurses, physical therapists, pharmacists, and others. New technology can relieve or exacerbate these personnel shortages.

Does the technology provide “value?”

Demonstration of total costs and quality is required for the true value of a new technology to be determined. The value equation must be applied from the context of all legitimate stakeholders. Clearly the patient perspective should dominate the discussion. Additional considerations in the demonstration of the value of a new technology must also include an evaluation of how it relates to the strategic interests and mission of the academic medical center and the risk management and legal liability implications.

Committee Recommendations

The IDT committee is consultative to senior management. As a consequence, recommendations, not decisions, are offered concerning the adoption of new technology. The committee may recommend: 1) adoption without provisions; 2) adoption for compassionate use only; 3) provisional adoption (limited number of cases; 4) adoption with clear eligibility criteria and treatment limits; 5) approve for research use only, or 6) do not adopt.

Conclusions

A number of lessons have been learned since the inception of the committee. Perhaps the most important lesson is the role of the stakeholder. Traditionally, much of the technology review process has remained hidden from the view of clinical stakeholders. But the committee determined early in its existence that a critical element of success was the involvement of the clinical stakeholder. Involvement of the stakeholder in framing of the clinical argument for the technology requires a complete review of the literature and objective assessment, not by the staff assisting the stakeholder, but by the stakeholder him- or herself. This process of critical review has lead many stakeholders to reconsider the value of a new technology and allowed them to recommend a far more limited adoption process than they originally intended. In at least one
instance a stakeholder became convinced the technology was not optimal and that newer devices in earlier stages of clinical investigation were worth waiting for. The stakeholder involvement in the clinical assessment and presentation permits the members of the committee the opportunity to seek clarification when necessary allowing for a better understanding of the clinical value.

Direct participation in the administrative assessment of the technology has allowed the clinical stakeholder to see the full scope of institutional issues that extend beyond the bedside and the direct application of the technology. Staff education, resource consumption, bed allocation and its impact on other critical clinical services provided are not the traditional areas of interest for clinical stakeholders. Financial analyses expose the stakeholder to the new technology’s true costs to the institution. In essence, the problem of asymmetry of information appears to be addressed in part by this extensive pre-meeting analytic process.

Technology assessment and adoption practices of academic medical centers will likely evolve from the current somewhat chaotic process to a more formalized one. Research directed toward development of medical products, including drugs, biologics and devices, will be impacted by this shift in the decision-making process. Evaluation of innovative diagnostic methods and medical and surgical procedures may be similarly impacted. Value assessment will by necessity increasingly drive and support rational adoption of new technologies by institutions and the medical community. Research administrators involved in clinical research should assess the ability of their institution to conduct high quality value analysis as well as traditional efficacy assessment. By doing so, many of the potential pitfalls encountered in this process can be avoided as we cross the boundary between innovation and practice in a rational and efficient manner for the benefit of all.

References
The Role of a Research Administration Program in Adverse Event Reporting

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Authors’ Note
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Abstract
The reporting, analysis, and management of adverse events (AEs) provide an ongoing assessment of risk in the context of a clinical trial and enhance the protection of human research participants and the informed consent process. Effective and efficient review of AEs has been a long-standing challenge for Institutional Review Boards (IRBs) and Research Administration programs, especially as protocols and ethical/legal issues become more complex. Furthermore, AE reporting is governed by many different regulations and sources, with inconsistencies in standards and requirements. Reporting standards for AEs
were adopted when single-center clinical trials were the norm. With the increased prevalence of multi-center trials, IRBs are now inundated with AE reports. This paper will review the current issues in AE reporting and the challenges encountered by research administration programs when reassessing current policies and procedures and implementing a significantly revised reporting policy. The implementation plan and educational strategies used with the investigators and research staff will be described. Preliminary outcome data will be presented to evaluate policy revisions and to take into consideration the concepts of “quality of review” versus “quantity of reporting.”

Introduction

Clinical research has endured remarkable and beneficial expansion in the past 25 years, although this growth has resulted in an unprecedented increase in workload for the human research protection system. Most of the expansion in clinical research has been in the form of multicenter trials, which present significant challenges for a local institutional review board (IRB). The dramatic increase in the number of multicenter clinical trials over the past two decades coincides with a tremendous influx of clinical trial funding from industry, which has resulted in the exposure of inadequacies in human subject protection programs developed to manage clinical trials on a smaller scale, usually at single sites (Morse, Califf, & Sugarman, 2001).

One of the leading challenges facing Human Research Protection Programs (HRPPs) is the volume of AE reports that sponsors and clinical investigators file with IRBs. The current process is burdensome, inefficient, and fails to provide IRBs with meaningful information needed to fully ensure the safety of human research participants. The federal Office for Human Research Protections (OHRP) has estimated that approximately 5% of all AEs reported to IRBs actually warrant some level of review; 70% have little or no impact or concern resulting in meaningful action(s) taken by an IRB, and only 25% require resources for assessment or further consideration by an IRB (Weschler, 2004). The current challenge is how to triage the 70% efficiently and address the remaining 30%, while dedicating resources toward action on the small percent of that latter group where an impact can be made. IRBs have a greater responsibility and ability to evaluate AEs at the sites over which they have purview.

As noted by Burman, Reves, Cohn, & Schooley (2001), additional trends include a recent major change in federal oversight that resulted in a three-fold increase in regulatory actions against local IRBs, with a marked increase in regulatory actions against the IRBs of academic medical centers (1 in 1997 compared with 14 in 1999). Inadequate review of safety reports was among the list of reasons for regulatory actions by both OHRP and the U.S. Food and Drug Administration (FDA). Recent reviews by the Office of the Inspector General (OIG) of the Department of Health and Human Services (DHHS) and the National Institutes of Health (NIH) concluded that the continuing review process should be reevaluated and that local IRBs should not be required to review off-site (external) safety reports (OIG, 1998; NIH, 1999). On the basis of a series of reports, the OIG concluded that IRBs are now forced to “review too much, too quickly, with too little expertise,” and with inadequate resources (OIG, 1998). A major contributing factor to this dismal outlook for HRPPs is the volume of AEs submitted to IRBs for review.
Background

A key factor in the current crisis in the function of local IRBs is the escalation of multicenter clinical trials as the consistent method for the performance of clinical research. Though Data and Safety Monitoring Boards (DSMBs) have become commonplace in multicenter trials, federal rules and regulations concerning human subject protections require that local IRBs bear the fundamental responsibility of research oversight (Morse et al., 2001). Current rules encourage researchers and sponsors to report all unexpected, serious, or related AEs to a number of parties, including IRBs, FDA, and other regulatory and research agencies in the United States.

One AE alone can result in a multitude of reports to various organizations, which in turn must be assessed by the IRB (Weschler, 2005). For multicenter clinical trials, an IRB receives individual external AE reports. The receipt of reports that are not aggregated and that come from disparate sources contributes to confusion and an added workload for the IRB. More importantly, the format of the reports jeopardizes the IRB’s ability to make an informed judgment on the appropriate action, if any, to be taken. According to Burman, et al. (2001):

Local IRBs were not designed to handle the initial evaluation and ongoing review required by the rapidly increasing number of multicenter clinical trials. Furthermore, local IRB review of the thousands of safety reports from multicenter clinical trials monopolizes resources without promoting patient safety. (p. 152)

These policies were effective when the majority of clinical studies were conducted at a single site; however, they are producing chaos with the increase in multi-center trials involving multiple researchers and numerous participants. There is certainly a need for IRB review of multicenter trials, but it is not clear that patient safety is enhanced by duplicating this process at the IRB of every study site. AE reporting ideally should provide useful information regarding safety in a clinical trial. The DSMB is chartered to review such duplicate reports of a single AE, while the local IRB’s responsibilities should focus only on those AEs involving human subjects of its own institution’s studies and continued review of the DSMB’s findings (Levine, 2001).

Morse et al. (2001) stated:

Some of the excessive burden that adverse event reports (AERs) create for IRBs may be attributed to following: confusing terminology in the regulations that govern trials, differing requirements of the governmental regulatory bodies involved in ensuring patient-subject safety, and inconsistencies in the regulations themselves. The FDA requires the investigator to “promptly report to the IRB all unanticipated problems involving risk to human subjects or others”. HHS regulations require prompt reporting to the IRB of “any unanticipated problems involving risks to subjects or others”. In contrast to myriad requirements for reporting AEs, US regulations lack provisions about how IRBs should handle these reports once they have been received. Flooded by AERs and poorly positioned to interpret the emerging trial data, IRBs have tended to focus on optimizing regulatory compliance instead of using AERs to determine whether the risk-benefit assessment for locally enrolled patients is affected. When the prospect of many individual IRBs in large studies all attempting to replicate an assessment of the safety and efficacy of the therapy of interest is considered, the implications are magnified. At the same time, the enormous amount of work...
performed by IRB administrators and members to complete these functions is likely to be costly. (p. 1203)

Morse et al. (2001) further observes that IRBs do not have sufficient statistical or clinical expertise or access to appropriate information to allow them to evaluate properly the issues of safety and benefit that arise in the course of a trial. As a result of these factors, IRBs frequently are unable to translate observations regarding individual AEs into a coherent assessment of the overall risks and benefits for a trial. (p. 1203)

To conduct a valid assessment of an AER, it is necessary to have information beyond that contained in the report itself, such as the number of patients in the study as a whole, the expected frequency of the AE reported, and, in a blinded study, information about whether the patient-subject in question is receiving the test agent. Information on efficacy is also necessary to weigh risks and benefits. (p. 1202)

When AEs are reported accurately, their potential importance may not be fully recognized if they are not reviewed and classified in a comprehensive and systematic fashion. Such activity would most likely fall under the charter of a DSMB and be arm’s length from the IRB.

Given the lack of harmonization of guidance on AE reporting policies and the trend towards increased IRB workload and burden, the research administration staff of the Center for Clinical Research at University Hospitals of Cleveland (UHC), developed a systematic process to address the issue of AE reporting and created a strategy for educating the research community.

**Purpose**

Evaluation and revision of event reporting policies and procedures by a research administration program are completed with the intent to improve the effectiveness and efficiency of the IRB in the protection of human research participants. The goals of the research administration program aim to interpret policy guidelines in compliance with current regulations, assess the impact of a revised event reporting policy on the quality and quantity of review, and develop a pilot collaborative educational strategy between the research administration office and the research community with regards to event reporting.

**Design and Methods**

An AE reporting subcommittee was established which included the IRB Chair and Vice-Chair, Clinical Research Manager, Research Compliance Specialist, and the Director of the IRB Office. An extensive review of the AE reporting literature was performed, including a search of IRB websites for related policies and procedures and an in-depth review of the federal regulations and guidances. Recommendations from the American Academy of Medical Colleges (AAMC) (Dickler, 2005) and Applied Research Ethics National Association (ARENA) and Public Responsibility in Medicine and Research (PRIM&R) (O’Rourke, Borasky, & Hansen, 2005) were reviewed as a final step in the policy reassessment process and to further focus the revised local policy (see Table 1). A revised Event Reporting policy was drafted, which included specific categorizations for AEs, unanticipated problems, and protocol deviations. The policy revision was distributed to the IRB for review and approval and to the IRB Executive Committee, IRB staff, investigators, and clinical research coordinators.
The Challenge from Ethics

Table 1
Recommendations from AAMC, ARENA, and PRIM&R (O’Rourke, Borasky, & Hansen, 2005)

<table>
<thead>
<tr>
<th>AAMC Statement Regarding Adverse Event Reporting Prepared for the FDA Hearing</th>
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<tr>
<td><strong>Internal AEs:</strong> IRB should review individual reports of serious, unexpected, and related events; all AEs that do not meet these criteria should be aggregated for Continuing Review.</td>
</tr>
<tr>
<td><strong>External AEs:</strong> IRB should review summary/aggregated reports of serious, unexpected, and related AEs.</td>
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<tr>
<th>Applied Research Ethics National Association (ARENA) and Public Responsibility in Medicine and Research (PRIM&amp;R) Guidelines</th>
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<tbody>
<tr>
<td><strong>Internal AEs:</strong> IRB should only review individual reports of AEs that meet one or more of the following criteria: event is serious and unanticipated, events that indicate an increase in the potential risk to subjects, event requires revision of the protocol, consent documents, and/or IDB.</td>
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<tr>
<td><strong>External AEs:</strong> IRBs should not review individual reports of external AEs; IRBs should receive aggregate reports with an analysis and conclusion at intervals appropriate to the level of risk; should only receive reports that require revision of the protocol, ICF, IDB or reports of unanticipated problems that may affect subjects at local site.</td>
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Educational feedback sessions and focus groups were scheduled with individual departmental research staffs to review the policy and further develop effective tools to promote investigator compliance. Issues and concerns were discussed openly and changes were made based on input received. Additionally, communications were distributed via e-mail to the research community, including an overview of the policy and its development, a flowchart, a policy synopsis sheet (see Table 2), and AE reporting logs. Overall, recognition of the need to improve event reporting efficiencies and to ensure that potentially significant events were reviewed adequately was met with positive feedback.
Table 2
Interventional Studies (Greater than Minimal Risk): Adverse Event Reporting Requirements

<table>
<thead>
<tr>
<th>Internal</th>
<th>External</th>
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<tr>
<td>Study Related or Possibly Study Related</td>
<td>Not Study Related</td>
</tr>
<tr>
<td>Death</td>
<td></td>
</tr>
<tr>
<td>Expected or Unexpected</td>
<td>Within 3 working days</td>
</tr>
<tr>
<td>Unexpected</td>
<td>Within 3 working days</td>
</tr>
<tr>
<td>Serious</td>
<td></td>
</tr>
<tr>
<td>Expected or Unexpected</td>
<td>Within 10 working days</td>
</tr>
<tr>
<td>Unexpected</td>
<td>At Next Continuing Review or Study Termination</td>
</tr>
<tr>
<td>Non-serious</td>
<td></td>
</tr>
<tr>
<td>Expected or Unexpected</td>
<td>At Next Continuing Review or Study Termination</td>
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Note. For all study designs (observational, non-interventional, and interventional), any event that changes the risk/benefit ratio or causes a change in the protocol or consent form must be reported to the UHC IRB within 10 working days of learning the event or of being notified of a required change.

A final round of educational feedback sessions was scheduled with departmental research staffs to review the policy revision and related reporting forms. Examples of AE reports were triaged in the session to provide practical experience with the new tools.

Following administrative policy review and feedback from the educational groups, the policy was officially enacted in August 2005. Full compliance (i.e., use of new forms and reporting strategies) was required by September 2005.

Retrospective collection of information back to January 1, 2005 began during the policy lead-in period from August through September 2005. This was done to enable descriptive statistical comparisons for the period immediately preceding the policy revision versus a post-policy time period. The IRB database was used to collect the raw number of AEs received and to differentiate between internal and external occurrences. The IRB database was also used to capture the total number of AEs reviewed by the full IRB for both the pre- and post-policy revision time periods.

Calculations were made of the percent of internal versus external event reports received, monthly average of total AE reports received, and the percentage of the AE reports brought to full IRB for review. Each of these measures was compared by time periods before and after the change in policy.

Results
There was an immediate reduction in the total number of AE reports received by the IRB in September 2005. This was especially
the case for the number of external AEs. This supported the argument that academic medical centers were not only inundated by the volume of event reports for review, but that the number of external reports was so great that it forced the inefficient use of resources and less-than-optimal reviews (see Figure 1). External AE reports yielded incomplete, duplicative, and minimally useful information while only increasing the IRB’s workload.

Figure 1. Percentage of internal vs. external adverse events before and after policy implementation.

The new policy was instantly effective in shifting the focus away from reviewing large numbers of AEs toward attention on internal reports (see Figure 2). Furthermore, changes had to be implemented to address a projected 89% increase in total AE reports submitted to the UHC IRB in 2005 (i.e., total AEs in 2004 = 4,680 and the total AEs reported through August 2005 = 5,892, or a projected annual total of 8,838).

Figure 2. Average monthly internal vs. external AEs before and after policy implementation.
Less than 1% of all external AEs were deemed necessary for full IRB review from January 2004 through August 2005. During this same time, 3% of all internal AE reports were brought to the board. However, since the policy revision more than 7% of the internal AE reports have been brought to the full board (see Figure 3). Thus, it appears that more focus is being given to events on which research administrators and IRBs can have a positive human subject protection impact.

**Figure 3. Percentage of internal AEs brought to full IRB before and after policy implementation.**

Due to a reduced volume of external AEs accompanying the policy change, more attention and resources can be given by the IRB to relevant internal AEs. Thus, patterns and trends in AEs can be identified and proper adjustments can be made to improve human subject protection outcomes.

**Conclusions**

The reduction of external AEs received by the IRB and the increase in proportion of internal AEs reviewed by the full board may be the result of confounding variables and continued analysis will be necessary to ensure results can be generally attributed to the policy revision. However, the immediate results of September to December 2005, demonstrating the desired decrease of external AE influx and increased full Board review of internal AEs, were corroborated by a second review of additional results from the initial months of 2006 that showed similar trends.

Preliminary monitoring of AE reporting policy revision outcomes suggests the following: 1) a decrease in the volume of AE reports may allow improved quality review of AEs by the IRB; 2) decreased focus on external AE reports is in line with national recommendations and allows for better use of research administration resources in focusing on internal AE review; 3) a reduction in time and IRB resources resulted from the policy revision, which contributes to improved Human Research Protection Programs (HRPPs); and 4) policy revision outcomes regarding IRB review of internal AEs need continued monitoring to determine long-term effectiveness.

Positive outcomes of collaboration between research administrators, the IRB, and the research community in the process...
of revising AE reporting policies and procedures include: 1) involvement of the research community in the development phase of a policy revision improves acceptance and enhances positive communications between research staff and research administrators; and 2) the use of focus groups and educational sessions increases the awareness of AE reporting requirements and predicts improved compliance.

Viewing the process of AE reporting in the broader context of human subject protection emphasizes the need for continued development of approaches aimed at maximizing IRB efficiency of AE report reviews.

On January 15, 2007, The Office for Human Research Protections (OHRP) issued revised “Guidance on Reviewing and Reporting Unanticipated Problems Involving Risks to Subjects or Others and Adverse Events.” This guidance provides instructive clarification of definitions for unanticipated problems and AEs, considerations for reviewing and reporting of unanticipated problems and AEs, and appropriate timeframes for reporting unanticipated problems to the IRB, appropriate institutional officials, the department or agency head, and OHRP. Based on the revised definitions, it is improbable that IRB procedures will change significantly; rather, the revisions will allow more obvious determination of the subset of AEs that are unanticipated problems that must be reported under 45 CFR part 46. Furthermore, the OHRP guidance supports the current UHC IRB practice for review of external AEs.

Specifically, OHRP advises that it is neither useful nor necessary under the HHS regulations at 45 CFR part 46 for reports of individual adverse events occurring in subjects enrolled in multicenter studies to be distributed routinely to investigators or IRBs at all institutions conducting the research.

Individual adverse events should only be reported to investigators and IRBs at all institutions when a determination has been made that the events meet the criteria for an anticipated problem. (p. 11)

OHRP further notes that AEs for multicenter studies “should be submitted for review and analysis to a monitoring entity (e.g., the research sponsor, a coordinating center or statistical center, or a DSMB/DMC) in accordance with a monitoring plan described in the IRB-approved protocol.” The OHRP guidelines for prompt reporting of unanticipated problems have established specific timeframes for reporting based on the specific nature of the unanticipated problem, the nature of the research associated with the problem, and the entity to which reports are to be submitted. As a result, the UHC IRB has developed a new policy, Reporting to Regulatory Agencies, Department Heads and Institutional Officials.

Finally, concerns remain that involvement of local IRBs in all aspects of multicenter clinical trials overloads the system, and as a result the local IRB cannot carry out its unique functions. Presently, HRPPs rely heavily on documentation of human research protection processes rather than more creative, quality improvement approaches to improve deficiencies. Improved efficiency in review of AEs by IRBs would allow for more emphasis on active monitoring of research conduct, including the informed consent process.
The Challenge from Ethics

References


Implementation of Systems to Support the Management of Research: Commentary from a UK University Perspective

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Authors’ Note
We would like to recognise the contribution of various colleagues, too numerous to mention by name, who have contributed to the systems projects described in this paper.

Abstract
The increasing complexity and diversity of a typical portfolio of research awards coupled with advancing technology makes successful implementation and delivery of system benefits more challenging than ever. Moreover, the role of systems in knowledge management is a fundamental issue faced by all research active organizations. One of the principal drivers for introducing better systems should be to serve the academic mission and make life easier for researchers; yet most appear to perform conversely, perhaps sacrificing potential benefits to meet the requirements of administration. The principal challenge thus is to deliver a system that meets the needs of both academic and administrative communities. This paper provides a commentary on the experience gained within a research office following implementation of two systems (one pre-award, the other post-award) and identifies key elements for successful delivery. The paper contains suggestions, based on our experience, of best practices and techniques that research administrators might adopt to ensure a well-managed project and its implementation. It concludes how, post implementation, users may begin to derive maximum benefit from systems and points to the advantages that high-quality knowledge management can offer a range of stakeholders.
Introduction

The research sector is rapidly changing as universities pursue academic excellence and develop more complex research strategies to drive their organisation forward. Management of the typical research portfolio of grants and contracts is no longer straightforward, and the systems that underpin administrative processes are becoming increasingly difficult to design and implement. The characteristics of the average research administration system require increasingly complex project management structures and techniques in order to implement, so much so that attaining successful delivery and deriving maximum benefit are significant challenges. This paper reviews key areas of best practice and elucidates methods of deriving benefits from the implementation of new research systems.

Knowledge management is a difficult notion to define; indeed, the definition of “knowledge” itself is often the subject of debate. For the purposes of this paper, “knowledge” is considered to be derived from meaningful information and from the results of making judgements, connections and comparisons. Succinctly, it concerns valuable information and its use placed in a considered context. Knowledge management can be defined in similarly broad terms as the process by which an organisation captures and shares the collective knowledge of its communities. Furthermore, it is important to recognise that knowledge management has a broad and wide-ranging impact upon the organisation, touching people, culture, processes, technology, leadership and governance.

A successful knowledge management strategy should be closely aligned to the organisation strategy, to ensure that benefits are linked to the overall business goal.

Close, well-managed relationships between corporate and knowledge management strategies are undoubtedly a powerful tool within an organisation. However, equally as important as recognising what constitutes the framework for a knowledge management strategy is the need to remember that not all information and knowledge is useful in every context. Selecting pertinent information and understanding that not all knowledge is worth knowing can focus strategy and avoid diluting benefits.

For research active organisations, achieving strategic goals and growth within the global economy has more often than not led to increasingly diverse and complex research portfolios. Research grants and contracts are a bigger and more competitive business for universities, bringing an increasingly higher volume of awards to the successful academics and their institutions, requiring increasingly higher levels of research support. However, with greater rewards emerge higher expectations in the form of bigger deliverables and more exacting professional management standards. It is in this context that the research organisation must establish a knowledge management strategy that maximises the benefits of an increasing research portfolio and supports the wider academic strategy.

Research organisations are talent industries that thrive on innovation and creativity. The challenge for universities is to ensure that knowledge management becomes embodied within the academic, management and administrative cultures to encourage fluid transfer of knowledge between people and systems. This paper recognises that knowledge management is concerned with many aspects of an organisation but chooses to focus on information systems and their delivery in a specific context. Information Technology (IT) is a key facilitator of
knowledge management and the medium through which valuable information can be stored, shared and managed. Paradoxically, however, IT systems can make knowledge management more challenging. A poor understanding of an organisation’s knowledge and IT strategy can lead to systems that pose more challenges than solutions. To avoid this, and to implement a successful system, an organisation should seek to unite the people and knowledge it requires with the types of IT systems it intends to deliver. It is essential that systems and information connect with people and processes to support an organisation’s mission.

In developing a successful IT strategy, it is critical to understand the needs of a variety of users and ensure that the strategy is framed by the organisational strategic mission. Increasingly, organisations have multi-component, modular requirements for their systems, but this is coupled with the recognition that systems and technologies can fail to meet the users’ needs. The challenge for an organisation is to deliver a system that can deliver the needs of all users in pursuit of achieving a common goal. The research sector is in no way excluded from this rationale. Indeed, the challenge of delivering effective knowledge management and IT systems is exacerbated by the complex nature of a typical research portfolio and the underlying research administration and management techniques. Moreover, the nature of the research environment is such that there is always the possibility of conflict when attempting to deliver a single IT system with a wide focus and user base. Managing the dynamic between the academic vision of a university and individual department needs, such as audit and accounting requirements, are significant challenges. To neglect this dynamic augments the risk of drifting from the mission behind a systems project.

It is the unique and delicate challenge posed by competing interests of the research environment that forces questions to be asked about the essence of research endeavour. What exactly is the nature of the business of research? Is it concerned with satisfying accountants, statutory requirements, administration, or the needs of funding bodies? Or is the purpose to develop academic and scientific excellence? Without answering these types of questions and maintaining a focus upon all types of users and their needs, a research organisation will fail to meet its strategic mission and fail to foster an effective knowledge management culture.

**Case Study: Imperial College London**

This paper provides a commentary on the implementation of research management systems from a research office perspective within the UK university sector. This example seeks to draw on the experiences of research managers and administrators to provide key elements for success, lessons learnt and methods for deriving benefit from combined IT and knowledge management strategies.

**1. Background**

Imperial College London was established in 1907 and is consistently rated in the top three UK universities. It is a world-leading, science-based university whose reputation for excellence in teaching and research attracts students (11,000) and staff (6,000) of the highest international quality. It embodies and delivers world class scholarship, education and research in science, engineering, management and medicine, with particular regard to their application in industry, commerce and healthcare.

Three years ago the college commenced a large-scale programme centred upon the people, processes and systems at
the core of its research support and administration. The vision behind this programme was to develop people and systems capable of supporting ‘cradle to grave’ research grant and contract administration and management, while reducing the administrative burden placed upon academics. The programme sought to provide research administrators with the support tools, both system and knowledge based, to ensure academics could concentrate on scientific research rather than bureaucracy. The programme was committed to deriving benefits from the systems pertaining to reducing data duplication, increasing operational efficiency and increasing management of information.

The college introduced two commercially produced information systems: a pre-award tool for academics and administrators, InfoEd Proposal Development (PD) and Tracking (PT), and a post-award tool, Oracle Grants, that nestled into an existing suite of Oracle finance modules. The intention was to integrate both systems seamlessly to support research application inception through to project termination and embed this within a culture that used information and knowledge creatively to further the organisational mission.

2. Key Elements for Success

2.1 Ask questions.

In implementing any project, whether it is IT related or otherwise, people need to understand why it is being carried out and what it hopes to achieve. A systems implementation project must define its mission. Particularly within a university, where stakeholders are often varied in their nature and needs, it is necessary to ask a number of questions and agree on the answers before contemplating the next steps. As research portfolios get bigger and more complicated, so do the systems that support them. A sensible starting point is for a research organisation to ask “big questions” of itself and to tackle the difficulties these pose head on. A few examples of the type of questions asked at the outset of the Imperial College implementation are as follows:

What is the vision for this organisation, particularly in terms of scholarship? How will the system serve and benefit the vision? Why are we doing this project? What will we deliver at the end of this project? Who are we delivering the project outcomes to? Who will benefit and why? How much will it cost? What is the cost/benefit analysis – does it add value? What is the impact of undertaking the project on day-to-day business and staff? Where are the skills required to make this happen successfully?

Answers will invariably differ from one university or project to the next. However, it is possible to draw parallels from our project implementation that may be of use to other research organisations.

Setting a vision for a research systems project is critical for success, but a vision should not be situated in isolation. Understanding how the project fits into the wider framework of the organisation is a challenging exercise but an essential one to set a clear and cohesive framework for a programme of work.

Understanding what you hope to gain must be clearly defined from the outset. The experience of implementing both pre- and post-award research systems has led us to suggest that the number of stakeholder groups affected cannot be underestimated; a number of common ones are shown in the table below:
The Challenge from Technology

Table 1
Typical Stakeholder Analysis Encountered During Early Phase of the Project

<table>
<thead>
<tr>
<th>Academic community</th>
<th>Finance</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Principal Investigators</td>
<td>• Financial Accounting</td>
</tr>
<tr>
<td>• Collaborators</td>
<td>• Financial Strategy</td>
</tr>
<tr>
<td>• Research staff/ Fellows/ Post-doctoral researchers</td>
<td>• Statutory reporting</td>
</tr>
<tr>
<td>• Students</td>
<td>• Accounts Receivable</td>
</tr>
<tr>
<td></td>
<td>• Accounts Payable</td>
</tr>
<tr>
<td></td>
<td>• Purchasing</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Research support services</th>
<th>Statutory</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Research management and administration (central and devolved)</td>
<td>• Internal Audit</td>
</tr>
<tr>
<td>• Academic departmental administration</td>
<td>• External Audit</td>
</tr>
<tr>
<td>• Human Resources (HR)</td>
<td>• Other statutory/government data returns</td>
</tr>
<tr>
<td>• Communications</td>
<td>• Customs and Excise</td>
</tr>
<tr>
<td>• Departmental finance</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Funding bodies</th>
<th>ICT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Charities</td>
<td>• ICT development</td>
</tr>
<tr>
<td>• Industry</td>
<td>• ICT support</td>
</tr>
<tr>
<td>• Research Councils</td>
<td></td>
</tr>
<tr>
<td>• Government Departments</td>
<td></td>
</tr>
<tr>
<td>• European Union</td>
<td></td>
</tr>
<tr>
<td>• Overseas agencies and organisations</td>
<td></td>
</tr>
</tbody>
</table>

A stakeholder analysis will assist in fully defining the needs and specifications of all stakeholders, which is key to systems success. This is as much an art as a science, and its importance cannot be understated. Moreover, we found that compiling the specifications as technical colleagues wanted was something alien to us (coming from a research office), and the learning curve was steep. However, it is essential that this document be full, robust and focused to ensure the system delivers what you, the user, require of it.

Knowing the project deliverables defines the project scope and provides a better chance of success. Interactions and dependencies between groups of stakeholders are also more clearly understood, thus minimising the extent to which particular stakeholder needs can be adversely affected by implementation.

Our experience is that answering these questions at the most senior levels of an organisation sets a framework within which a project structure can be clearly conceived and designed. Equally as important is to continually revisit these questions and answers as the project progresses. From this standpoint a project stands a much better chance of successfully meeting the needs of all stakeholders.

2.2 Set a project structure.

Imperial College favours the Prince2 project management methodology (Office of Government Commerce, UK) as its approach to delivering its new research information systems. Prince is a structured method for achieving effective project management that has evolved in the UK. It was first established in 1989 by the UK Central Computer and Telecommunications Agency as a standard to be used for all government IT projects and was subsequently modified as an approach to
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project management for all projects. Since 1996 it has been a standard requirement that UK public sector projects are run using this version of the approach, Prince2.

Key Features of the Prince2 approach include: 1) a clear business case which sets out the aims of the project; 2) a defined and measurable set of “products” or results, together with the activities to achieve them; 3) defined resources (including financial and people requirements) linked to activities; and 4) an organisation structure with defined responsibilities to manage the project.

Typically, these features are captured in a set of project documents against which aims and progress are monitored, risks identified and managed, and changes to aims or activities controlled. However, it should be noted that Prince2 procedures may vary according to the type of project and organisation implementing the project itself. Also, some aspects of project management are well covered by other well-proven methods, including people management techniques, generic planning approaches and methods for controlling budgets. Prince2 is a coherent set of project management concepts and processes that provides a minimum set of requirements for a properly run project. The approach fully recognises, however, that any given project may require individual tailoring of particular aspects of the Prince2 methodology.

Leadership and buy-in from the uppermost levels of management within Imperial College were essential in driving and coordinating the entire programme. To this end a programme board was established to include key senior stakeholders. The Programme Board itself was chaired by the Senior Responsible Officer (in Prince2 terms), a critical role to which ownership of the work programme is attributed and which has ultimate responsibility for delivery.

The Programme Board, among other responsibilities, provides strategic guidance in areas of organisational, IT and knowledge management. Through this cohesive senior management structure, the information systems implementation for both InfoEd and Oracle Grants was project managed with the intention that they were delivered on time and on budget, with maximum benefits to the college.

At the project level it was important to establish a Project Director and Technical Project Manager for each system implementation and to ensure communication with the Programme Board. However, equally critical were the composition and leadership of key areas of project work – or “project workstreams.” Workstreams carefully composed from key stakeholders can prove to be a valuable source of research knowledge and, when harnessed within a well-managed project, should lead to a system that effectively supports administrative and academic needs. It was also our experience that workstreams form a number of activity hubs within the project structure where knowledge is shared and documented by different stakeholders for the benefit of both project and organisation. The very nature of workstreams encourages the development of key relationships between organisational areas and communication networks. Both projects employed the use of workstreams and sought to involve a wide range of stakeholders, including principal investigators. This type of framework encourages communication between departments and units and enables the project manager to understand dependencies and process flows within an organisation. Ultimately, this should help ensure the project results in more accurate and timely system deliverables. The project structure adopted is shown in Figure 1.
Accompanying the project structures at Imperial College, and in line with Prince2 methodology, is a Project Initiation Document (PID), which forms the crucial document against which a project is executed, governed and measured. In constructing a PID, the project is setting out in document format its purpose, approach and objectives. The PID should act as a valuable reference point for the project manager and team and function in conjunction with a project plan to monitor progress.

Universities have a variety of stakeholders with many competing requirements from prospective systems. In constructing a PID, it is imperative to pay attention to the audience and ensure that roles and responsibilities are clearly understood within the project structure. Ownership and accountability for deliverables are key to successful implementation of a system, and empowering individuals with the opportunity to shape their requirements leads to a more consultative process. Stakeholders--such as research support services or academics for example--should be aware that they are representatives for their particular area and, as such, have a responsibility to communicate the consultation process beyond that of the immediate project vicinity.

Clearly defined deliverables should be included within the PID and agreed to and signed off on by the project team. Sufficient time should be allocated to
carefully consider the milestones necessary to achieve success, and deliverables should be both specific and timely. The Imperial College approach was to allocate each deliverable to a specific project workstream and assign a responsible owner, workstream group and deadline. Deliverables were then allocated a unique reference number and cross-referenced with the project plan in an approach that was found to greatly assist the project manager in identifying the critical path to success while ensuring accountability across workstreams.

2.3 Promote project engagement and interaction.

The experience of implementing systems such as InfoEd Proposal Development and Tracking and Oracle Grants has illustrated that research administration and systems are increasingly complex in their nature. Imperial College’s experience was that securing active stakeholder engagement and dedicated business resources became critical to the success of research system projects. Research administrators in this project indicated that they required bigger, more intricate tools than initially expected to support their often complex administration scenarios. It was therefore, more difficult for project staff distanced from day-to-day operations to ensure that requirements and nuances are captured successfully.

We recognised that staff members did not always have sufficient time or skills for the project workstreams they were assigned to, particularly during busy periods in their day-to-day jobs. It should also be remembered that one of the biggest stakeholders was the research support service division, which was also greatly affected by the overall programme of work. These systems would have a huge impact on the way that research support services carried out their day to day job and supported the academic community.

It was decided that dedicated business resources were critical to the success of the college’s systems implementation; therefore a cadre of systems “Superusers” were assigned to each of the InfoEd and Oracle Grants projects to support requirements and testing workstreams. The superusers were selected from within Research Services teams, and the role was intended to ensure that business expertise became focused on project work for sustained periods of time. It is essential that superusers located within the business unit and specifically from within the core stakeholder group. The benefits to the project were immediately recognisable, with a greater range of business specifications and more thorough User Acceptance Testing (UAT) across a range of scenarios. Indeed, the engagement of key research administrators acted as a conduit for knowledge transfer back and forth between the Research Services teams and the systems projects and later assisted in facilitating training and embedding systems users within the research support area.

The challenge in supporting the superuser model adopted by Imperial College is the need to backfill those superusers seconded to projects for one or more days per week. Moreover, it is important for (senior) research and project managers to make realistic assessments of the impact of these absences. Research Services offices are busy environments, often under pressure to deliver effective support to the academic community; moving staff from within such teams to focus entirely on project work can have an adverse impact on daily functions. Effective and increased communication to manage academic and other support services expectation, together with “clever” resource management, should help minimise the impact during periods when research administration teams are missing key members.
Encouraging business participation in systems implementation, through workstreams and superusers, should ensure that stakeholders are actively engaged and focused upon their responsibilities as part of the project teams. It is also important to note that projects to establish IT research systems are not IT projects per se. In other words, projects should be driven by the customers; encouraging active and dedicated participation from academics, research support staff and other university areas is an approach worth considering. Managing good relationships between IT colleagues and IT vendors is essential within project structures, to ensure a balanced lead on direction.

3. Lessons to be Learned

Imperial College encountered a number of problems and learned some valuable lessons. If the project team were to ask: “Would we do anything differently next time?” the answer would be yes. The process of implementing new systems was a steep learning curve for those of us from Research Services: the college delivered a successful project whilst learning key lessons for the future.

3.1 Continual revisiting of the programme mission.

In the hectic schedule of events that fuels the project “juggernaut” on its critical path, it is easy for the project team to lose sight of both the project goals and organisational mission. Particularly within the university sector, the typical research portfolio poses challenges in managing complexity, accountability and constrained funding. Information systems are expected to serve a number of stakeholders and satisfy accounting, reporting and audit needs, many of which are essential. The challenge facing us was to ensure that the mission (focussing on relieving the academic community of administrative burdens) was not forgotten in the day–to-day development of requirements and system specifications.

In particular, the post-award administration of research grants and contracts is invariably focused upon the management of financial data. While this is certainly a key aspect of a post-award system, it should not be the sole purpose. It is our experience that failure to place research (in terms of academics and research support) at the forefront of the stakeholder community risks placing the organisation at the mercy of its systems rather than placing the systems in service to the users. As well as continually referring to the project mission, it was also important to continually update the stakeholder community with progress. To this end, the implementation team produced project newsletters and roadshows for research administrators and academics.

3.2 Involvement of dedicated, skilled research staff.

The contribution of excellent, skilled IT people together with research administrators and managers was key to the project. Seconding members of Research Services teams to the project structure and ensuring that dedicated expertise was at the disposal of the project management had a hugely successful impact on implementing InfoEd Proposal Development, Proposal Tracking and Oracle Grants. There are two key themes that deserve attention: ensuring (1) that seconded staff have appropriate skills...
and the ability to cope with a potentially steep learning curve and (2) that they are involved from an early stage in the project.

Ensuring dedicated project expertise will often be at the expense of the first line research support. Moreover, the needed people are likely to be among the most skilled, and sometimes more senior, individuals within the team; this situation encourages an organisation to carefully consider the value of project deliverables and the size of the challenge. Our view is that highly skilled and experienced research staff provide vital expertise to the project process and often the size and complexity of projects are underestimated.

Bringing extra resources to the projects focused primarily on final system implementation when User Acceptance Testing (UAT) and sign-off was of major importance. However, involving Research Services staff earlier in the project timeline would have benefited development of the requirements and specification processes; staff would also have realised earlier the impact of the proposed changes to systems and processes. It often happens that changes to office processes must be made to correlate with new systems; tackling this area earlier in a project saves time, effort and confusion. It is also important to note that UAT is naturally set within the context of requirements; involving research administrators in the end-to-end process of defining requirements and then testing them gives rise to tighter, more efficient progression and buy-in.

3.3 Maintaining a business focus.

Both systems were implemented to serve research and academic needs. A key challenge faced by these projects, however, was to maintain a business focus on the processes and not allow the project to drift into the realm of simply “becoming an IT project.” To preserve a research perspective, it was our experience that “research customer” and “technology supplier” roles for user and IT developers, respectively, are clearly defined. The dynamics between such roles are finely balanced, and from the perspective of this case study, a lack of user input coupled with unguided IT involvement can cause a project to lose end-user perspective.

Clear communication among IT vendors, internal IT staff and users is important to the successful delivery of new systems, and technical relationships need to be cultivated carefully. Like many universities, Imperial College is a complex organisation that requires complex systems; the challenge is to work effectively with in-house technical “experts” to communicate business requirements in a format to all users in ways that they can understand and act on. Research administration, in particular, is becoming increasingly difficult to understand for those who are not part of that endeavour. By developing close relationships with our technical colleagues, based on mutual respect, it is possible to deliver successful research administration systems. Those of us in research support should not have to “hide” behind the efforts of IT colleagues (because a lot of the language and requirements appear alien); rather, we should all learn from each other.

Encouraging active input from stakeholders and maintaining a firm grip on the project direction will ensure that decision making within the project structure is more informed and the outcomes better understood. This in turn makes it easier for IT colleagues and vendors to concentrate on technical details and development. From the experience of the project team in the Imperial College case study, it was apparent that the projects
became overly IT-centric and drifted from the mission when focus was diverted. When this occurred, decision making either stalled or was deflected into a strictly IT perception of the project and IT personnel did not clearly understand the needs of users. A user-led systems project with solid IT relations would appear to be an effective model for ensuring that informed decisions are delivered in a timely manner and ultimately assuring that the project stands an improved chance of contributing to the organisational mission.

3.4 Remembering post-implementation support.

Implementing research systems does not end at the point of “go-live.” It is critical to ensure that a post-project resource is agreed to support system users, at least in the short to mid term, and particularly around areas of training, further testing and first-line user support. A valuable lesson learned by this project is that research administration systems are expected to handle significantly complex setups. Academics demand, and rightly so, that both systems and research administrators are ready to support their needs immediately upon go-live. It is at this point that the benefits from seconding staff to a systems project and, in the case of Imperial College, building a group of Superusers become increasingly apparent. The process of embedding a knowledge management culture within the organisation, specifically within research administration, takes on greater significance as project participants take key learning experiences back to their teams to use in “real-life” scenarios with academics. This is increasingly important for multi-campus universities, such as Imperial College, where academic and research support teams are spread out geographically and knowledge gaps can develop if superusers are not positioned at every location.

Similarly, it is likely that a post-implementation programme will be necessary to care for teething problems or enhancements. Again, superusers act as a valuable resource for requirement focus groups or testing and this can benefit post-implementation development that might arise. Similarly, entirely new programmes of work, that might arise unanticipated, can benefit from knowledgeable superusers that are already in place, thus minimising the impact of resourcing projects with inexperienced or less knowledgeable staff members. Using experienced research administrators as interchangeable vehicles for knowledge between projects and their day job, with realistic management of backfill, is a powerful tool in enabling an organisation to maximise benefits from challenges.

4. Starting to Derive Maximum Benefits

Following any system implementation an organisation should be able to clearly demonstrate value-added for both stakeholders and the organisation. It is important to look at the original aspirations of the project against what has actually been delivered and assess ways in which benefits can be maximized. In our case, it was important to recognise that a systems project does not finish at the go-live date.

Post-implementation, phased releases/packages of additional functionality—were put in place to begin to build upon the new system from the base level that had been initially implemented. The core project team were retained for a significant time following implementation; similarly, superuser expertise continued to be utilised to aid particular areas of ongoing system improvement. Training, supplemented by sustained superuser involvement, helped to ensure that research administrators did not feel isolated or ill-equipped following
new developments and were able to support academics and complete their normal work processes effectively. It is also important to ensure staff have the capability and confidence to identify additional refinements and problems in this early stage and the project should encourage this interface.

It is apparent that real benefits can be derived from a carefully designed system once it is in place. At the outset, benefits appear abstract and intangible, and it is difficult to foresee all the possibilities; however, after implementation users begin to see the added value. Success can breed success in project management and systems implementation; a robust and credible system that is widely used can begin to form a vital network for the transfer of information and thus management of knowledge. Encouraging stakeholder engagement throughout the entire implementation process and post implementation adds substance to this framework, embeds a network of knowledgeable people, and starts to develop a knowledge-management culture.

In summary, we suggest that organisations follow these key points to facilitate a successful implementation: 1) define a clear vision or mission for the project; 2) maintain project focus and don’t lose sight of the objective(s); 3) implement a robust project management structure to allow the right people to make the right decisions at the right time; 4) ensure appropriate user-control over the project and invest in skilled, dedicated people; 5) do not underestimate the size of the project or the impact of other considerations on the mission; 6) do not underestimate the value of communication; 7) understand the importance of the post-project phase and look to maximise benefits; and 8) ensure to engage all stakeholders.

Conclusion
Changes of systems are a big commitment for all concerned. By appropriate planning and project management, it is possible to minimise the pain and increase the benefits from these ventures; system projects are hard work and it is important to celebrate success regularly. Implementation of a new system should be seen as enhancing the academic mission and viewed as an integral component of knowledge management in an organisation. Their value comes when information creates a knowledge base which can be used to drive future strategy – it helps us to understand our activities and relationships and hence make better informed decisions. The greatest challenge is to use this knowledge in an innovative way that begins to dynamically fashion the culture of an organisation. In this way, the ethos will change from one that often cites organisations as being at the mercy of systems to one that embraces them.

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Social Network Analysis to Evaluate an Interdisciplinary Research Center

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Authors’ Note
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Abstract

We sought to examine the growth of an interdisciplinary center using social network analysis techniques. Specific aims were to examine the patterns of growth and interdisciplinary connectedness of the Center and to identify the social network characteristics of its productive members. The setting for this study was The Center for Interdisciplinary Research on Antimicrobial Resistance (CIRAR) at Columbia University. Periodic surveys and social network analysis comprised the study design. The data for this study included a relational survey taken by all members of the Center at three time points over one year. Respondents confirmed whether or not they had “heard of,” “met,” or “know the work of,” or had “worked with” each of the other Center members. Data were analyzed using the social networking software program Organizational Risk Analyzer (ORA). Over time the social network increased in size, density, centralization, and complexity. The density of connections among and between different disciplines in the Center varied from Time 1 to 2 to 3; some increased, some decreased, while others stayed the same. Finally, the total degree centrality and the betweenness centrality of Center members were highly correlated to productivity. The study shows that a number of characteristics of an interdisciplinary research center can be quantified and described using social network techniques. Data from these analyses can be used to evaluate a center’s progress, identify important indicators of leadership, identify areas of strength and need for improvement, and inform decisions on strategic direction.

Key Words: Interdisciplinary, Social Networking, Collaboration, Research, Growth

Introduction

Despite this nation’s potential to deliver the finest health care in the world, the translational blocks from basic science to human studies and from clinical research to practice and policy clearly “impede efforts to apply science to better human health in a expeditious fashion.” (Sung et al., 2003) One way to expedite the translation of research to health care delivery is through interdisciplinary research, which crosses the traditional boundaries of profession, department, or institution. Indeed, much has been written in recent years about the value of interdisciplinary collaboration, to the extent that it has become one of the academic bandwagons of the day, and the National Institutes of Health (NIH) has identified interdisciplinarity as an explicit priority in its recent Roadmap, a strategic plan for future funding priorities http://nihroadmap.nih.gov/interdisciplinary/index.asp.

In a recent survey, more than 2,000 fulltime academic researchers ranked their collaborators above salary and job security as their highest priorities for job satisfaction (Grimwade & Park, 2003). Nevertheless, academic environments generally have established incentives for an entrepreneurial, independent approach to research. It has been suggested, in fact, that the academic culture hinders collaboration and, hence, slows translational research (Pober, Neuhauser, & Pober, 2001; Sung et al., 2003). Thus, data suggest that an interdisciplinary culture must be well planned and executed before success is possible. Despite this, there is little empirical evidence of a change in the traditional departmental academic systems and networks, with many initiatives identified as interdisciplinary actually being reconfigurations of traditional modes of multidisciplinary research (Rhoten & Parker, 2004).
The ultimate purpose of interdisciplinary research is to develop new knowledge or solve a relevant human problem by combining the skills and perspectives of multiple disciplines. This requires a realistic understanding of the nature of disciplinarity. Although academic disciplines are often thought of as “bodies of teachable knowledge” (Woollcott, 1979) or as “conceptually specific structures” (Robertson, Martin, & Singer, 2003), these dehumanized descriptions do not capture the entire domain. Disciplines are also “organized social groups,” “sets of social relationships” (Lattuca, 2002), and “isolated domains of human experience possessing its own community of experts” (Nissani, 1997). Many of the challenges inherent in interdisciplinary research emanate from the isolation of disciplinary experts, resulting in knowledge silos. Viewed in this way, accomplishing interdisciplinary research becomes, at least in part, an issue of social interaction and the creation of integrated social networks.

**Social Network Analysis**

Social network analysis involves a unique set of tools capable of revealing the patterns of human interactions. Social networking can be used to track the extent to which a network grows and also answer questions regarding how it grows: What is the disciplinary composition of the team? Is the team all connected or are there subgroups? Are there central players crucial for creating connections between people? Social network analysis can elucidate many patterns of team assembly, such as team size, membership composition, and tendency to repeat previous collaborations that can determine the performance of creative teams (Guimera, Uzzi, Spiro, & Amaral, 2005).

A “social network” is defined as a group of collaborating (or competing) entities that are related to each other (Aviv, Erlich, Ravaid, & Geva, 2003). Network methods focus on the relational linkages between entities (i.e., individuals or groups of individuals or “things,” such as electronic message boards, citations, or computer stations), using techniques based on graph theoretic methods (Wasserman & Faust, 1994). A graph is a finite set of dots called nodes that are connected by edges that represent links. To create a social network graph, individuals are represented as nodes in a network and the relationships that connect them (such as “heard of” or “worked with”) are represented as edges that connect the nodes. Each edge indicates an information link between two individuals. Graphs are often notated in the form of a matrix thus allowing quantitative calculation using operations from matrix and linear algebra to mathematically define characteristics of the network members and structure (Scott et al., 2005).

There is a growing body of literature on the application of network methods in the study of organizations (Borgatti & Foster, 2003; Brass, Galaskiewicz, Greve, & Tsai, 2004; Lin & Carley, 2003). Although these methods have been used in business as well as in the social and basic sciences to describe interdisciplinary interactions (Barabasi, 2005; Cott, 1997; Girvan & Newman, 2002; Newman, 2001; Singer & Kegler, 2004), there has been minimal application of social network analysis within health care research, and little is known about how an interdisciplinary research center develops after its establishment.

**Specific Aims**

The purpose of this project was to evaluate the growth of an interdisciplinary research center using social network analysis. Specific aims were threefold: to understand the patterns of growth over
time (e.g., did members join as individuals or in subgroups?); to evaluate the extent and patterns of connectedness among center members across disciplinary and departmental boundaries and over time; and finally to determine the network characteristics of productive center members and subgroups based on work products and emerging research teams.

**Methods**

**Sample and Setting**

The Center for Interdisciplinary Research on Antimicrobial Resistance, CIRAR (P20 RR020616, National Center for Research Resources, NIH), was funded as a planning grant in 2004 to develop interdisciplinary research aimed at reducing antimicrobial resistance. The core team of researchers and staff included 15 individuals from 12 different academic departments or divisions: four nurses and four physicians as well as experts in epidemiology, microbiology, higher education, biostatistics, dentistry, health policy, informatics, economics, organizational systems, and behavioral sciences. Student liaisons from the various health professions schools were also included as full members of the team. This social network study included these core team members and others added to the team over time as they became involved in activities of the Center.

**Data Collection**

At the first general meeting of the Center, core team members completed a survey in which they were asked to indicate, for every other team member as well as for the external advisors and University oversight group (which provides input regarding direction and goals of the center but generally does not directly contribute to work products), four levels of relationship: whether he/she had heard of, knew the work of, had met, or had worked with each of the others. The same survey was administered at 6 and 12 months after the formation of the Center. As individuals joined and departed from the Center their names were added or removed from the survey. Individuals who left the Center were primarily students whose period of study had ended (6), or faculty members who left the University or whose interests were peripheral to the purpose of the Center (3).

**Team Building and Expanding Efforts**

We employed several tactics to build connections among existing members of the Center and expand the team. To facilitate interactions among members, the core team met monthly, and several smaller working groups met at regular intervals. Within the first few months of the Center’s establishment, each core team member made a presentation describing his/her work during part of the monthly team meetings. The smaller working groups gave members a chance to work together; each group was responsible for carrying out one aspect of the Center’s mission (e.g., identifying gaps in the field and planning educational seminars). The Center also held a team-building half-day retreat composed of short talks from core team members followed by “brain-storming” breakout groups to identify ideas for collaborative projects.

Students, postdoctoral fellows, and junior faculty were recruited by the Center through requests for applications for small pilot grants. Eight grants were awarded. We also increased our exposure through periodic seminars and guest speaking events that were extensively advertised. The Center convened two major events aimed at expanding potential collaborative partnerships: a meeting of interdisciplinary center directors across the university and a discussion forum with pharmaceutical
company researchers working in the field of infectious disease. An informational pamphlet about the Center was available at all events. Any new contacts made at these events were maintained through an e-mail database that was continuously updated. Descriptions and photos of all events were posted on the Center’s website http://www.cumc.columbia.edu/dept/nursing/CIRAR/), along with announcements for future events and minutes from all meetings.

Data Analysis

We selected a set of network measures to address the three specific aims for evaluating the Center. To evaluate patterns of growth over time, we examined the size, density, complexity, and centralization of the full network at the beginning and 6 and 12 months after formation of CIRAR (Times 1, 2, and 3). We also examined the average numbers of cliques that developed among the members in the network, and the average effective network size. See Table 1 for definitions of all network measures.

To evaluate cross-disciplinary collaboration, we examined the network densities of “worked with” interactions within and among three disciplinary subgroups (Medicine, Nursing, and “Other,” which encompassed Public Health, Microbiology, Dentistry, Sociology, and Education). Members affiliated with more than one discipline were grouped with their primary affiliation (e.g., a nurse epidemiologist was grouped with Nursing). To reflect growth of network by discipline we examined the change in each discipline as percent of the network at Times 1, 2, and 3.

Finally, to determine characteristics of productive CIRAR members, we examined the relationship between network position and productivity. Productivity was measured in 5 categories: 1) leading a workgroup, 2) co-authoring a publication, 3) giving a presentation, 4) participating in the CIRAR retreat, and 5) participating in a grant application. Each individual received a productivity score based on activity in each of these categories.
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Table 1
Definitions and Interpretation of Network Measures Used in this Study

<table>
<thead>
<tr>
<th>Network Level Measures</th>
<th>Measure</th>
<th>Definition</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Network Density</td>
<td>The density of a network is equal to the total number of connections divided by the number of possible connections. The number of possible connections assumes that each person can have a link with each other person. Normalized the range is 0-1.</td>
<td>Represents the extent of communication within the network. Higher numbers (above .03) suggest faster information propagation and greater group cohesion.</td>
</tr>
<tr>
<td></td>
<td>Overall Complexity</td>
<td>Combined density of all relational graphs at each time period (i.e., heard of, know work, met, worked with). The ratio of the number of links versus the maximum possible links for the meta-matrix. Normalized the range is 0-1.</td>
<td>This measure is a predictor of network performance. As complexity increases an organization performs better up to a (unknown) point where too much complexity results in excessive coupling and the potential for error cascades.</td>
</tr>
<tr>
<td></td>
<td>Network Centralization, Total Degree</td>
<td>The centralization of the network based on the extent to which the majority of the connections are to a small set of nodes. Expresses inequality or variance in the network as a percentage of the most unequal network possible. Normalized the range is 0-1.</td>
<td>Indicates whether or not there is asymmetry in the distribution of connections. It indicates the degree to which communication is centralized around a single agent or small group. More centralized groups tend to be more hierarchical in nature.</td>
</tr>
<tr>
<td></td>
<td>Clique Count</td>
<td>The average number of maximally connected subgroups. A clique is defined as subgroup of people who are all directly linked to each other.</td>
<td>A measure of social integration and network cohesion. Members of a clique can use their strong relations to drive the process of constructing knowledge.</td>
</tr>
<tr>
<td></td>
<td>Effective Network Size</td>
<td>The average of the observed number of each individual’s personal links within the network, minus redundant links (i.e., connections to the same individual through more than one person).</td>
<td>Indicates the average reach of the individuals: i.e., on average, for each person, how many others are likely to get information from them or to send information to them, even if that information has to go through an intermediary.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual Member Level Measures</th>
<th>Measure</th>
<th>Definition</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Centrality, Total Degree</td>
<td>Number of direct connections that a person has to others in the network. Normalized the range is 0-1.</td>
<td>Indicates the level of extroversion. Higher numbers indicate more connectivity</td>
</tr>
<tr>
<td></td>
<td>Centrality, Betweenness</td>
<td>Measures the extent to which flows of information between diverse others pass through this person. Normalized the range is 0-1.</td>
<td>Indicates the extent that a person is a conduit for information. People high in this measure often influence what flows in the network, and often serve as gatekeepers and brokers of information.</td>
</tr>
</tbody>
</table>
We then used two measures to assess network position. Total degree centrality measured the number of ties each member had to others in the network. Individuals with many ties are most likely to receive or generate whatever information is flowing through the network. Betweenness centrality measures the extent to which an individual connects those persons who may not be directly connected to each other, thus serving as a link between unconnected people (Freeman, 1979). Individuals who rank highly on this measure serve as intermediaries who are in a position to control information flow in the network (e.g., what information is received and how it is perceived). Spearman’s rho was calculated to determine if individual productivity in CIRAR was associated with these measures of network prominence.

The relational data collected by survey at the three time points in the Center’s development were analyzed with the software program Organizational Risk Analyzer (ORA: http://www.casos.cs.cmu.edu/projects/ora/index.html). ORA is unique among network analysis programs because it can be used to analyze multiple networks collectively. This allows calculation of measures that reflect the complexity found in organizational systems. Analysis in ORA is based on formal logic, matrix algebra, and discrete and continuous equations (Reminga & Carley, 2005). The results are index numbers that convey aspects of the distribution of relational ties within the network (Hanneman, 2001).

**Results**

**Aim 1: Patterns of Growth over Time**

**Network Size and Centralization**

The network increased steadily in size from 22 members at Time 1, to 39 members at Time 2, and to 47 members at Time 3 -- an overall increase of approximately 113%. The “worked with” network in CIRAR showed steady increase in network centralization, from 0.21 at Time 1 to 0.41 at Time 2 and 0.50 at Time 3. Network centralization expresses inequality or variance in the network structure as the degree to which the network connections gather around a few central individuals (Scott, 2000). It can be equated with coordination in the sense of “command and control.” Lower scores indicate distributed connections and higher scores suggest a more cohesive group. That is, the higher the centralization the greater the likelihood that there is one person, or a small set of people, to whom everyone is connected. Thus, over time as the CIRAR is maturing, an increasingly centralized and perhaps hierarchical organization is emerging.

These patterns are displayed in Figure 1; note the more tightly centralized core at Time 3.
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Network Density and Complexity

Network density and complexity over time are compared in Figure 2. Network density describes the extent to which individuals are connected by measuring the number of connections present in relation to the number possible (i.e., as if everyone were completely connected to everyone else). Density for CIRAR’s “heard of” and “met” networks increased between Times 1 and 2 and fell between Times 2 and 3. Density in the “know work” network remained steady over time. Between Times 2 and 3 the “worked with” network showed increasing density. In other words, as the organization matured, members tended to retain a certain level of understanding of what others did (know work), even though they were less likely to have actually met these others. This suggests that the group may be moving to role-based interactions predicated on generic knowledge of what others did. At the same time, new members tended to join based on extant collaborations with current members, while current members increased collaboration, resulting in an overall increase in who “worked with whom,” despite the growth in membership.

The network complexity measure calculated all of the links recorded in the four networks we measured (heard of, know work, met, and worked with) in relation to all the links possible. The organizational complexity of CIRAR increased steadily over time, from 0.05 to 0.26, a sign of a more tightly knit organization with broadening interests and goals. The pattern of falling density and increasing complexity suggests that, on average, the typical person knew/ was connected to fewer people in the overall group, but the overall group was becoming more complex as members became associated with more knowledge and activities. In general, as complexity increases, to a point, an organization will perform better due to increased connectedness (and the associated awareness of what others are doing) among sub-groups and processes (Carley, 2002) and sufficient redundancy to enable adaptivity.
**Clique Count**

Cohesion in the structure of a network contributes to the creation of knowledge through shared reasoning and perspective (Burt, 2000). One indicator of cohesion is the presence of cliques – subgroups of participants within the network for which all possible links are present. In collaborative organizations cliques can drive the process of constructing knowledge by taking advantage of their strong inter-relations (Aviv et al., 2003). The average number of cliques to which a CIRAR member belonged at Time 1 was only 3. The average increased to 34 at Time 2 and fell slightly to 31 at Time 3 as research teams began to coalesce. However, there was wide variance in the clique counts, with standard deviations ranging from 0-22 at Time 1, and 0-128 at Times 2 and 3 (see Table 2). This suggests that the CIRAR was becoming more cohesive. However, whether there is a natural cap on cohesion or an optimal number of cliques (e.g., people do not have the cognitive resources to be in more than 20-40 cliques) is a point for future research.

**Table 2**

*Measures of Network Cohesion*

<table>
<thead>
<tr>
<th>Measure</th>
<th>Time 1</th>
<th>Time 2</th>
<th>Time 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Clique Count (+/-std)</td>
<td>3.1 (5.48)</td>
<td>34.1 (41.15)</td>
<td>31.1 (35.60)</td>
</tr>
<tr>
<td>Minimum/Maximum</td>
<td>0-22</td>
<td>0-128</td>
<td>0-128</td>
</tr>
<tr>
<td>Mean Effective Size (+/-std)</td>
<td>1.38 (2.67)</td>
<td>5.14 (5.58)</td>
<td>6.93 (6.90)</td>
</tr>
<tr>
<td>Minimum/Maximum</td>
<td>0-10.2</td>
<td>0-18.4</td>
<td>0-2.6</td>
</tr>
</tbody>
</table>
Effective Network Size

While individuals in a network may have redundant links to each other through several network members, the effective network size indicates the size of each person’s network without this redundancy, and so gives a better sense of the actual number of people to which a network member is effectively linked. (Burt, 2001) On average, CIRAR’s members increased the size of their personal network of connections from less than 2 at Time 1 to nearly 7 at Time 3, as displayed in Table 3. Hence, on average, over time, those who join CIRAR are likely becoming increasingly linked into CIRAR related activities by interacting with other CIRAR members.

Aim 2: Cross Disciplinary Collaboration

Disciplines as a Percent of Network

Over time, the number of members in each disciplinary group increased. At Time 1 individuals in the physician group comprised 35% of the network and were the dominant group. Nursing, public health and microbiology comprised 23%, 18%, and 9% of the network, respectively, and individuals in “other” disciplines comprised less than 15%. At Time 3, CIRAR had a more balanced membership: physicians comprised 26% of the network and no longer dominated the disciplinary makeup. Instead, individuals in the “other” disciplinary group comprised about one-third of the network. Nursing remained at 23%, public health decreased to 11%, and microbiology increased to 13% (Figure 3). Essentially, over time, participation from various CIRAR subgroups was becoming more democratic.

Figure 3. Change in Each Discipline as a Percent of the Network
Within and Between Group Densities

Over time the density of connections within the disciplinary groups in CIRAR fluctuated. Nursing started at Time 1 with a value of 1.0 (100%), indicating that all possible connections were present within the group. This fell to 78% at Time 2, and rose to 93% at Time 3. Density within the Medicine group was 29% of possible connections present at Time 1, 33% at Time 2, and 26% at Time 3. A similar pattern was found within the “Other” disciplines group, which had 17% of possible connection present at Time 1, 19% at Time 2, and 14% at Time 3. This suggests that, for most groups, members initially joined to pursue group goals, e.g., Medicine working on medicine-related matters. However, over time, as more members of their field joined; they had less in common with those in their original field.

Over time the density of connection between the disciplinary groups decreased slightly. Between “Other” disciplines and Nursing there was a decrease between Time 1 and Time 3 from 38% to 32% of possible connections present. Between Nursing and Medicine there was little change (from 30% to 29%), and there was a slight increase between the “Other” disciplines and Medicine, from 17% to 19% of possible connections present. This suggests that individuals might not be interacting across fields.

Note that we have seen three trends: 1) increased interaction overall, 2) decreases within a field or stability, and 3) possible decreases between fields. For CIRAR the number of members is likely growing faster than the connections among members. However, of those connections among members, a greater percentage appears to be between disciplines, suggesting that the group as a whole is still in a developmental stage.

Aim 3: Characteristics of Productive Members

There was a strong relationship between individuals’ productivity scores and measures of network centrality. Productivity in relation to total degree centrality and betweeness centrality produced correlation coefficients of 0.75 and 0.70 respectively (two-tailed p<0.001). In other words, individuals who knew more and collaborated tended to be more productive.

Discussion

As an exploratory center funded by the NIH Roadmap, the ultimate goal for CIRAR is to establish an interdisciplinary research network aimed at reducing antibiotic resistance. In this study we examined the development of CIRAR through an empirical descriptive analysis of the social network. Our results shed light on how patterns of social interactions evolved with the needs and priorities of the interdisciplinary team. The priority for the CIRAR in Time 1 through Time 2 was to expand the network and increase the familiarity among team members. During Time 3 the priority shifted to fostering emerging subgroups to work together on grant proposals. Many of the changes in network properties examined in this study reflect this basic shift in priority over time.

The period between Time 1 and 2 was characterized by marked growth and increased cohesiveness. The size, density, and centralization of the network increased, suggesting that, not only did membership flourish, but members were becoming a more tightly knit group—more familiar with each other and one another’s work. Growth in network density is a structural characteristic that fosters information propagation, enhances information flow, and influences...
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how effectively individuals can act and plan future activities (Wu, Huberman, & Tyler, 2004). Growth in network centralization shows a trend toward more cohesive organizational structure. The interactions among team members were quite dispersed at Time 1, but by Time 2 and 3 had started to coalesce around focal individuals or common activities (see Figure 1). This trend is mirrored by an increase in the effective size of the average individual network. At the end of the first year, CIRAR team members on average were linked to three times as many people than at onset. These trends corroborate previously reported observations of interdisciplinary research group dynamics in which a sense of shared authority grows (Israel, Schulz, Parker, & Becker, 1998).

As the priorities of CIRAR’s leadership team shifted between Time 2 and Time 3 from growth and expansion to formation of focused research teams, there were measurable changes in network dynamics. There was a steady rise in overall network complexity that reflected growth in multiple levels of associations among CIRAR team members. As the size of the network continued to increase, team members were less likely to know or have met the “new wave” of people. However, there was some increase in members working together, as demonstrated by increasing clique counts, a sign of more cohesion and potential opportunities for knowledge-generating collaborations. At the same time the variability in clique counts was great, indicating that there were many CIRAR members who were not in cliques at all, and the presence of a few quite large cliques. This pattern could be a result of all members of a clique each convincing one previous contact, who was not known by other group members, to join the center, or a few people who were already associates joining as a group. While this finding does not mitigate the positive effects of increasing clique counts over time, it does show a pattern of growth that can occur as organizations build structure, and therefore supports characterization of CIRAR as an organization still in the formative stages.

Over time CIRAR experienced changes in disciplinary make-up and cross disciplinary interactions. While at Time 1 membership was dominated by those primarily affiliated with Medicine and Nursing, by Time 3 a network emerged that was not dominated by any single disciplinary group. Also notable was the climb in team members in the “Other” disciplinary category. By Time 3 about one-third of the network fell into the “Other” category, which included those primarily affiliated with disciplines such as Dentistry, Pharmacy, Sociology, and Administration. These trends suggest that, as one might suspect, interdisciplinary centers grow in the direction of greater heterogeneity and lesser disciplinary dominance.

When we investigated the densities within and between disciplinary subgroups in the “worked with” network, the overall trend showed either slight or no meaningful difference. Due to the efforts made to forge relationships among disciplines, we expected to see little increase in density within disciplines. We did perceive that new members who joined CIRAR were working with others outside of their discipline, yet the density of connections between disciplines decreased (with the important exception of the network between Medicine and “Other”). These findings lead us to a number of insights. The absence of robust increases in connectivity within and between disciplinary sub-groups in the presence of increased density and complexity in the full “worked with” network suggests that working relationships forged within the Center may be complex and do not fall...
along disciplinary lines. Our findings also suggest that within- and between-group densities are of limited use for describing small sub-groups. Network density is a proportion of actual connections to all possible connections; thus, in small groups each new team member affects this ratio markedly. Finally, a study period of one year may be too short for the connections within and between disciplinary subgroups to reach their full potential.

One of our goals was to determine the network characteristics of highly productive members. We were not surprised to find that the most productive members were both highly connected themselves and well positioned to act as go-betweens to connect others. The greater the number of links an individual has translates into greater access to the flow of information. More information may translate to more insight into possibilities for cross-disciplinary interaction. Since productive individuals also served as intermediaries for others to interact and collaborate, they were in a position to participate in any work resulting from the connections they fostered. It is logical to conclude that more “connected” individuals have greater opportunities to be productive in an interdisciplinary setting. An interesting question for future research is whether the network characteristics of productive members (total degree centrality, betweeness centrality) are the result of personal traits and skills that can be taught or cultivated to improve the overall productivity of an interdisciplinary center.

Conclusions
The social network analysis of the growth of an interdisciplinary center revealed many trends that may be useful in the planning and implementation of future interdisciplinary endeavors. It also allowed us to quantify changes in size, density and cohesiveness of the Center’s membership. In addition to growing in size, members also began working together more and became a more cohesive group. The Center also became more heterogeneous over time; individual disciplines decreased in percent of the total network. The most productive members of the Center were also the most connected and more likely to be those through whom others were connected to each other. We recommend the use of social networking analysis as an objective, quantitative means to assess the functioning of interdisciplinary partnerships.

References


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Evaluation of Strategies for Building a Research Culture – An Empirical Case Study at an African University

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Abstract
The impact of change strategies for developing research at an African primarily undergraduate institution is considered using a case study of the University of Botswana. After an analysis of the existing situation, a short research policy, written in understandable terms, was developed. The policy was structured so that it could be used for subsequent compliance assessment. A lengthy approval process involving consultation with all faculties increased institutional buy-in. A new Office of Research and Development managed the implementation. Motivators such as research awards and recognition were introduced to encourage staff to develop research programmes. Simplified but transparent internal funding mechanisms were also introduced. Staff attitude surveys were undertaken just after the policy was implemented, and again approximately 18 months later. The impact of the changes was assessed through a compliance exercise. The survey showed a positive change in staff attitude to research, despite a significant increase in teaching workload during the period. There was also a sustained increase in competition for available internal research funds. Compliance with the policy increased, although full compliance was achieved in only a few areas.

Introduction
In a previous publication (Studman 2003a), the first author of this article described a variety of factors involved in the development of a new Office of Research and Development at the University of Botswana. Although in a developing country, which consists mainly of the Kalahari Desert, the University of Botswana has received relatively strong financial government support since its establishment in 1982, and it has experienced dramatic growth in the number of applications for admission from students eligible for
tertiary education. Thus, by 2005 there were approximately 15,000 equivalent full-time students.

The factors that supported the financial well-being of the country and the consequent demand for tertiary education included the combination of a stable society, the discovery of diamonds in 1967, a democratic and peaceful electoral system, and generally benevolent governance with low corruption. However, in recent years, economic pressures, such as the demands on government funding for the civil service, education and other services, have forced the government, to exert more control over expenditure, including restricting the level of support for the university, while still requiring it to accept increasing numbers of students. As a result, between 1997 and 2003, the overall student-staff ratio deteriorated from 12:1 to 16:1. In practice, due to staff vacancies, the figure was often around 19:1.

As an institution with a vision for academic excellence (University of Botswana, 2003), the university recognised and acknowledged the principles of research-led teaching (Hattie & Marsh, 1996; Geiger, 1993; Lipset, 1994; Pratt, 1997; Zubrick, 2000), despite its predominantly undergraduate teaching history. The role of research in national development was also recognised (Studman, 2003b). However, in the late 1990s the university also recognised that its research activity was not satisfactory, and so set about improving the situation. It shared the problems of many other predominantly undergraduate institutions as described by Hazelkorn (2002).

Studman (2003a) outlined changes introduced to develop the research culture at the university. An analysis of the strengths, weaknesses, opportunities and threats (SWOT) of a given situation was conducted (SWOT analysis is a commonly used strategy to understand any situation). The key challenge areas identified were: 1) no strategic planning or alignment of research with university goals and strategies; 2) poor use of internal funds; 3) an absence of accountability for resources; 4) no management of the quality of outputs; 5) no structure for commercialisation of research; 6) limited postgraduate research; 7) insufficient motivation for some staff; 8) administratively complex research procedures, but no effective research support structure; 9) increasing teaching workloads; 10) insufficient training in research management, methodology, and communication; 11) no database of research capabilities, and few reported research outputs; and 12) lack of funding source information. In addition, some staff preferred private consultancy to research for financial reasons, sometimes at the expense of their teaching responsibilities. Clearly, major changes were required.

After prioritisation, and after assessing the available capability of the Office of Research and Development staff, strategic changes introduced initially included: 1) development of research policy; 2) recovery and utilisation of internal funding through simplified, transparent procedures; 3) introduction of a quality and accountability management programme; 4) introduction of encouragements to undertake research; and 5) training in research proposal writing.

As recommended by Drummond (2003), we developed a plan to evaluate the effectiveness of changes. While an ultimate measure of success in expanding research is an increase in the number of research outputs (i.e., papers, books, presentations, patents), it is too early for the changes described in this paper to be fully realized. Moreover, as Ramsden
(1994) has pointed out, many factors may affect research outputs. Other recognised measures such as the Frascati system (an international standard for assessing performance in research and experimental development which was developed by the Organization for Economic Co-operation and Development at a meeting in Frascati, Italy [OECD], 2002) were deemed to be inappropriate to the current level of the university’s development. Also, due to the challenges listed later in this paper, complete data are not yet available. Therefore, we opted for a longitudinal study of staff attitudes toward research as a clearer indication of the impact of changes introduced by the research office.

Intellectual challenges exist with the assessment of some of these goals. The perception of quality management in a university context is still a challenging concept, misunderstood by academics and management alike (Houston & Studman, 2001). Internationally the Frascati system has been largely adopted as a measure of research activity and development (OECD, 2002). The Association of Commonwealth Universities has also developed benchmarking procedures for evaluating research offices (Waugaman, 2004; Kirkland & Day, 2005).

Limited support was also provided to enable staff to identify external research funding opportunities. Other desirable changes, such as the development of postgraduate research studies; publicity on research activity; management of consultancies; and policies on intellectual property, ethics and research centres, were developed but delayed for various reasons until 2005.

**Development of Research Policy**

A research policy was developed and approved in 2002 (University of Botswana, 2002; Studman, 2004). The policy was written in a format that enabled an evaluation of compliance. It was given high priority and developed in harmony with the university’s overall strategic goals, as recommended by Drummond (2003).

The policy was designed to be straightforward and relatively short. It established the basic aims of the university with regard to research, and emphasized those areas where growth was desired. The policy was then circulated by e-mail throughout the university, and went through the normal approval procedures. At the University of Botswana, this was a lengthy process involving several committees, from departmental level to senate and, finally, to the university council. This process typically takes around two years. The research policy was no exception. Therefore, it was necessary to utilize the policy as a working document for decision-making even before it could be approved. The policy indicated that the Office of Research and Development would be responsible for implementation, and that the guidelines would be placed in the university handbook. In this way, the practical aspects of policy implementation could be undertaken simply by using a document that could be changed relatively easily, without seeking faculty, senate and council approval.

Once the policy was approved, attempts were made to familiarise staff with its content. Few academics can be expected to find time to read a research policy, so we decided to remind staff continually about the conditions and aims of the policy. Electronic media, meetings with faculty boards and faculty executives, individual
consultations, and reports to senior management all served the purpose. It was essential to refer to the research policy frequently in discussions with staff so that gradually they became familiar with its terms.

Recovery and Utilisation of Internal Funding through Simplified, Transparent Procedures

The majority of research funds were being allocated to faculties on a per capita basis. Faculties were using their own procedures for approval and allocation of funds. In many cases, these procedures were obscure, poorly advertised, and often excessively bureaucratic and complex. As a result, most faculties were stockpiling research funds in internal accounts. With the deans’ agreement, early in 2001 all unused research funds were returned from faculties to a central funding pool. In addition, a review of all existing research projects was initiated, and funds in inactive accounts were also returned to the central funding pool. In this way, almost P3 million (US $800,000), or roughly four years of internal funding, was recovered. The per capita system was abandoned. To meet faculty demands for discretionary research finding, some funds (roughly P 600,000 in total) were then re-distributed to faculties based on 1.3 times the total funding each faculty had allocated in the previous year. The message to faculties was clear: use the resources or lose them. After the first two years of operation under this system, the faculty component was calculated according to the number of reported research outputs. Both methods were unpopular with some deans.

The remainder of the available money was allocated through a series of university-wide funding rounds. In complete contrast to the previous system, a simplified application form was drawn up, deadlines were set for applications, and funding rounds were advertised throughout the university. Initially, several funding rounds were advertised, including those that focused on specific topics such as HIV/AIDS, or were limited to specific areas (e.g., new staff or large projects). The initial response was moderate. After a 12-month trial, we changed to two rounds per year, one in February and one in September. As a result, interest in making proposals increased dramatically. By 2005 applications for funds were typically around P4 million to P5 million per annum, with up to 50 applications each year. This represented a quadrupling of the number of research proposals. The university’s financial administration responded by doubling the internal research funding allocation to P1.6 million per year.

The process of selecting projects was also made transparent. Initially, project proposals were sent to faculty research committees for an assessment of quality. Faculties were asked to comment on and rank their proposals. However, they were not allowed to reject proposals at this stage. All proposals were then returned to the central administration. At the second stage, representatives of the faculties were asked to assess all proposals on their strategic merit. To enable this, a series of strategic criteria were drawn up. These criteria were important to the specific aims of the university’s research policy, and were also chosen so that in principle they applied equally well to any area of research. Examples of such criteria included potential for external funding; evidence of collaboration among different departments, faculties and external researchers; and involvement of postgraduate students. Finally, proposals had to justify their...
relevance to the strategic goals and vision statements of the university and the country.

After various trials with different versions, the university eventually settled on a system in which new staff were given priority for funding, up to a fixed limit. In this way, staff members were given the opportunity to access funds and undertake research when they first arrived at the university.

An important aspect of the internal funding system was its transparency. Full details of the procedure were publicized, and before each round a workshop was held for prospective applicants. At this workshop the procedures were discussed and the guidelines were explained, with the intent of aiding staff to complete application forms. The internal round was also an opportunity to provide practical training on writing research proposals for external funding.

**Introduction of a Quality and Accountability Management Programme**

There was no recognizable mechanism for ensuring staff accountability for research funds provided. In some cases there was no evidence of research activity, suggesting that staff were simply pocketing the money. Accountability checks were introduced, including the requirement for an annual financial report and a closing report giving a full financial summary of the use of funds. Failure to provide these meant that the funds would be recovered from staff salaries.

Staff were also expected to demonstrate how they were using the research funds by providing a one-page report every six months, with a more detailed report each year. In these reports, staff were expected to show some evidence of progress. If reports were not produced, funds were frozen and subsequently returned to the central pool for reallocation. In addition, faculty research committees were required to distribute funds allocated to them during the financial year. Any remaining funds at the end of the year were returned to the central pool.

**Introduction of Encouragements to Undertake Research**

Mechanisms introduced to encourage research growth are outlined below:

**Research Awards**

A system of recognizing and rewarding top researchers was introduced. This included a cash prize as well as recognition of the individual researcher. The awards were made to top researchers, the best emerging staff, and the best team leader. Separate awards were made for Sciences and for the Arts.

**Key Accounts**

New accounts were introduced so staff members could receive part of the overhead or administration income generated by the university from research activities. The policy specified that 40% of the overhead charge would be made available to the staff member for research related activities, while 20% would go to the department. In this way, both the researcher and the head of the department were encouraged to seek externally funded projects with significant overheads. In practice, the university set a minimum level of 15% for the overhead charge. Even so, it was often difficult to encourage researchers to include the overhead charge as part of the overall cost of their project proposals. Researchers only rarely sought more than the minimum 15% overhead specified. In 2005 the concept of any form of full cost recovery for research
projects had yet to be introduced to the university culture.

**Community of Science Databases**

The university subscribed to this database of research funding information, providing weekly e-mail alerts of research opportunities and enabling all registered staff to search for funding in their particular area of interest.

**Database of Research Outputs**

Staff outputs were recorded in a database made available on the university website. This represented the beginnings of a marketing tool to demonstrate to the country the research activity of the university. However, we experienced great difficulty in obtaining accurate details of research outputs from staff. There were glaring inconsistencies between information reported in annual appraisals and research funding proposals, and the information reported to the database. Attempts to establish the database as the only record of research outputs, to be used by the entire university for promotion and appraisal purposes, were unsuccessful.

**Appointment of Assistant Directors**

Additional staff positions were created in Research and Development. The two key areas identified for priority were quality management and research funding. After many delays, including the resignation of a staff member after three months on the job, more stable appointments were made to these positions late in 2004.

**Training in Research Proposal Writing**

Courses were run in conjunction with the internal funding rounds as outlined above.

**Experimental Study**

The target population for the study was the teaching staff of approximately 700 in the seven faculties at the University of Botswana. The university internal telephone directory was used to identify teaching staff. A questionnaire was developed and tested by interviewing 18 randomly selected staff representing all the faculties of the university. The results of this pilot study were used to revise the questionnaire. Questions focussed on research activity, research funding, reasons for doing research, knowledge of university research policy, research awards and overall attitudes in doing research, as well as demographic details.

The questionnaire was mailed to each faculty member, with a numbered return envelope. The numbers were used to identify those who had not responded so they could be contacted for follow-up. A double-blind system ensured that the researchers could not link questionnaire responses to individuals, but at the same time the list of respondents was available to secretarial staff. After two weeks, reminders were sent by university e-mail, with the questionnaire as an attachment. The secretarial staff received any electronic responses and printed them out to preserve anonymity. A pen was sent to respondents as compensation for the time taken in completing the questionnaire. Approximately 18 months later a repeat questionnaire was sent out to the entire university teaching staff, with a similar e-mail follow-up. A numbering system was again used to determine which staff had responded to both questionnaires, although it was not possible to compare responses from the same person directly.

A mini-survey of opinions of Research Office staff was undertaken to determine...
whether the university was complying with the research policy, by surveying selected staff with a questionnaire. It listed the 40 research policy statements and asked respondents to assess compliance on a 0–5-point scale. The objective was to test whether the pilot exercise could be extended to a wider selection of staff.

Results

Demographics

The demographics of the two sets of data were very similar. A total of 199 responses were received in the first survey, and 170 in the second. Seventy-five people responded to both questionnaires. In the second survey, 75% of the respondents were male, compared to 73% in the second survey. Hereafter, unless they are identical, figures from the second survey will precede those from the first (which may also be presented parenthetically). In both surveys 36% of respondents had the rank of senior lecturers, 18% (19%) were professors, and 44% (46%) were lecturers. Seventy-two percent (67%) had PhDs, while 27% (31%) had masters degrees.

Overall Attitude to Research

The responses were divided into three groups: those who agreed or strongly agreed with a statement, those who were neutral, and those who disagreed or strongly disagreed.

There were some differences between the two surveys in response to questions about attitude to research at the University of Botswana (U.B.) (Table 1). A total of 80% (69%) of the respondents agreed or strongly agreed with the statement that research is encouraged at U.B. Only 9% (16%) disagreed.

Table 1

Research Attitudes – Percentage Comparison of Results Between the First and Second Surveys

<table>
<thead>
<tr>
<th>Statement</th>
<th>Agree First survey</th>
<th>Agree Second Survey</th>
<th>Neutral First survey</th>
<th>Neutral Second Survey</th>
<th>Disagree First survey</th>
<th>Disagree Second Survey</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research is encouraged at U.B.</td>
<td>69</td>
<td>80</td>
<td>15</td>
<td>10</td>
<td>16</td>
<td>9</td>
</tr>
<tr>
<td>The U.B. research administration assists me to do research</td>
<td>35</td>
<td>44</td>
<td>29</td>
<td>36</td>
<td>36</td>
<td>21</td>
</tr>
<tr>
<td>U.B. financial services assists me to do research</td>
<td>38</td>
<td>33</td>
<td>33</td>
<td>42</td>
<td>29</td>
<td>25</td>
</tr>
<tr>
<td>In my department, research activities are encouraged and supported</td>
<td>68</td>
<td>74</td>
<td>16</td>
<td>21</td>
<td>16</td>
<td>7</td>
</tr>
<tr>
<td>Consultancies should be discouraged for the good of U.B. as a whole</td>
<td>13</td>
<td>15</td>
<td>16</td>
<td>17</td>
<td>71</td>
<td>68</td>
</tr>
<tr>
<td>To meet its obligations to society, U.B. should do more research</td>
<td>91</td>
<td>96</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>There has been a positive change in attitude amongst my colleagues in</td>
<td>39</td>
<td>46</td>
<td>42</td>
<td>37</td>
<td>19</td>
<td>17</td>
</tr>
<tr>
<td>the past 12 months</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personally I am more enthusiastic now about doing research than I was</td>
<td>37</td>
<td>44</td>
<td>38</td>
<td>32</td>
<td>25</td>
<td>26</td>
</tr>
<tr>
<td>12 months ago</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of respondents

| Number of respondents | 199 | 170 | 199 | 170 | 199 | 170 |
In the second survey, 44% of respondents (35%) agreed with the statement that “the U.B. research administration assists me to do research,” while 21% (36%) disagreed. On the other hand, Financial Services were viewed slightly less favourably: 33% (38%) agreed that “U.B. financial services assist me to do research” while 25% (29%) disagreed.

Responses to both surveys concurred with the statement that “In my department, research activities are encouraged and supported,” as 74% (69%) agreed or strongly agreed and only 7% (16%) disagreed. Most people felt that consultancies should not be discouraged. The statement “Consultancies should be discouraged for the good of U.B. as a whole” was only supported by 15% (13%) while 68% (71%) disagreed. Nearly all respondents – 96% (91%) – felt that, to meet its obligation to society, U.B. should do more research; only 2% (3%) disagreed.

Slightly more respondents to the second survey felt that there had been a positive change in attitude among colleagues in favour of doing more research in the previous 12 months: 46% (39%) agreed and 17% (19%) disagreed. At a personal level, there was also a slight increase in enthusiasm. “I am more enthusiastic now about doing research than I was 12 months ago” was supported by 44% (37%), while 26% (25%) disagreed.

**Sources of Information about Research Activities**

In a separate question introduced in the second survey, respondents were asked to indicate their main sources of information on research matters. Seventy-two percent of respondents strongly agreed or agreed that the U.B. e-mail group was where they had learned a great deal about research activities. Only 12% disagreed. In order of priority, the other sources of information favoured by respondents were: research seminars (58% agreed, 13% disagreed); other staff members (49% agreed, 21% disagreed); research mail group (46% versus 19%); presentations and research meetings (45% versus 29%). In all, 34% found the Community of Science database very helpful in identifying possible sources of funds while 13% did not. It is therefore clear that the Office of Research and Development should continue to provide information through all these outlets, and that more effort should go into alerting staff about the research funding databases.

**Knowledge of Research Policy and Awards**

The number of staff who were aware of the research policy – 82% (60%) -- showed a significant increase in the second questionnaire; only 18% (40%) were not aware. Seventy-one percent (45%) of respondents were also more aware of research awards to individual researchers.

**Reasons for Undertaking Research**

Results were generally similar for the two surveys: 89% of staff always or almost always did research because it helped their careers and 86% enjoyed doing research. Doing research to be known as a good researcher always or almost always applied to 68% (58%) of respondents.

Interestingly, financial incentives were not seen as a main reason for doing research. Only 13% (14%) always or almost always did research for financial incentives whereas 56% (63%) indicated that they rarely or never did research for this reason. Similarly, the departmental requirement on the staff member to do research was not a major factor: only 23% (16%) always or almost always did research for this reason, whereas 60% (65%) rarely or never did.
Demand for Funding

Just under half of the respondents planned to seek internal research funding within the next 12 months: 49% (48%) would seek support, while 15% (21%) were not sure and 36% (30%) would not. Of these, 46% (37%) indicated they already had funds, while 37% (27%) said funds were not needed. Only 3% (7%) were not interested. Forty-seven percent (43%) of respondents would seek external research funding, 22% (31%) were unsure, and 31% (26%) would not. Of the latter, only 3% (7%) were not interested, while 17% (34%) already had funds and 42% (25%) did not need external funds for their research. When asked in the second survey to identify obstacles to seeking funds, 17% cited lack of experience in writing proposals, 3% noted fear of rejection, 3% cited lack of previous success, and 9% did not know where to get information on funding.

Interestingly 59% (52%) of respondents indicated they were doing research that did not require funding; 44% (42%) were undertaking research funded by the university, while 29% in both surveys were undertaking externally funded research. Only 8% (15%) indicated they were not undertaking research.

Incentives to do Research

In both surveys, a large proportion of staff – 79% (85%) -- reported that being given time to do research would be an incentive. Promotion was second (61% in both surveys). Cash provided an incentive to only 32% (34%), and special commendations motivated only 29% (47%) of respondents. Receiving training in research management (an option only in survey 2) was an incentive for 32%.

Constraints

When staff were conducting research, several factors were identified as constraints or difficulties. Thirty-eight percent (46%) identified financial limitations as always or almost always a constraint, while only 18% (16%) said they were rarely or never a constraint. In the first survey, responses about other factors (availability of personnel, financial administration, support and encouragement, or equipment) were all evenly divided between those who felt they were almost always a constraint and those who felt they were not, and in all cases the number of responses either way was between 32% and 37%. In the second survey slightly fewer staff indicated the following as constraints: availability of personnel, 26% (35%); administration, 23% (32%); and equipment, 28% (37%). Support and encouragement were constraints for 33% (35%), and not a constraint for 38% (37%), suggesting little change between the two surveys.

When staff were not undertaking research, lack of time was identified as always or almost always a reason for 65% (61%), while only 8% (11%) felt this was rarely a constraint. Lack of incentives constrained 32% (36%), but was not a problem for 42% (40%). Only 4% (13%) of staff felt constrained because their head of department was not supportive, compared to 84% (76%) who felt this was not a constraint. In the second survey, no one felt that lack of interest in doing research was a constraint; 7% in the first survey did. In additional questions in the second survey, 69% of staff felt always or almost always constrained by too much teaching, 49% by too many meetings, and 42% by lack of research assistants.
Not all respondents answered every question on constraints. However, each question identifying a possible constraint was answered by between 50% and 90% of the respondents in both surveys, with time being the most often answered, and lack of interest the least.

The study of compliance with research policy showed that, while only a very small number of policy statements had been fully implemented, an equally small number had not been undertaken at all. The mean score was 40% compliance.

Discussion
There was a steady improvement in the opinions of staff about research support, and, despite the pressures of increased teaching loads and financial constraints, there was an improvement in the attitude of staff towards doing research.

The increased number of internal research proposals shows that the new system has encouraged staff to seek funding. However, there has been only a small increase over the study period in the intention to seek internal or external funding. It is also worth noting that, while almost half the respondents to both surveys said they intended to seek funding, only 50 to 60 applications were received. Thus, intention did not always translate into action.

The slight difference between the two surveys in response to the question of whether there were sufficient incentives to do research suggests that incentives are not yet convincing to inactive staff. On the other hand, staff were clearly more aware of the research policies and incentives, indicating that the methods used to promote these were having an effect. The reasons given for engaging in research should be treated with caution. Although the results suggest that financial incentives are not a significant factor, this may not be accurate; in internal meetings it has been suggested that this result was largely due to a sense that this would be an “inappropriate” response to the question. Alternatively, the high level of negative responses suggests that financial rewards could be less important to staff than both management and academics assume in general conversation.

The high level of unfunded research reported suggests that financial indicators should not be considered the sole gauge of research activity. This may be related to the specific research discipline. However, it is also possible that staff could be undertaking both funded and unfunded projects at the same time, or the unfunded projects could be minor studies undertaken on an irregular basis. Nevertheless, it is clear that unfunded research activity should not be ignored altogether.

It is also clear that time is felt to be a major constraint on research activity. Staff believe they would be able to undertake more research if they had fewer teaching responsibilities.

The pilot study on compliance with the research policy showed that the university could potentially benchmark performance against its policy documents by repeating this exercise at regular intervals.

Conclusions
There has been a steady improvement in staff attitude towards research over the period of the study. The most effective factor has been simplification of the internal funding system, coupled with its
transparency and fairness. Other incentives have not yet made a significant impact in overall attitudes. However, staff have only recently become more aware of the new policies and incentives. Staff at the University of Botswana identified time constraints as the major restriction on their research activity. Unfunded research may be a component of the overall research activity. The university has a long way to go to achieve full compliance with its own research policy, but it has made an encouraging start.

References


Foreign students and scholars make substantial contributions to U.S. research efforts and technology development. However, according to a federal government intelligence assessment, access to sensitive U.S. technology by those students and faculty members has imposed a significant but unquantifiable cost to the United States. Research administrators must manage these risks through their export control compliance programs. The primary “auditor” for the U.S. government has issued several reports on this effort.

The Government Accountability Office (GAO) is well known for its reports to Congress on almost any topic imaginable. It recently turned its attention to the subject of export controls, with a series of reports to the House Judiciary Committee. One of these reports, GAO-07-70, specifically addressed the issues surrounding export-controlled information at universities.

The Committee asked GAO to review how academic institutions and the U.S. government protect against the illegal disclosure of such information. This request was based, in part, on prior work by GAO and congressional testimony by a National Academy of Sciences official in September 2005 that over 55 percent of the engineering Ph.D. students in the United States are foreign-born. Another reason for the request was the identification of risks of improper disclosure identified in the Office of the National Counterintelligence Executive, Annual Report to Congress on Foreign Economic Collection and Industrial Espionage — 2004, NCIX 2005-10006 (Washington, D.C., April 2005).

In its report to the Committee, GAO first described the universities’ approach to research (particularly their orientation to fundamental research not subject to export control). GAO then identified the steps the universities have taken to comply with government export control regulations. Finally, the report assessed the efforts of the Departments of Commerce and State to determine the risk of export violations in university research.
In its review, GAO contacted 13 universities based on their international student populations, export license applications, and federal grants and contracts. GAO analysts interviewed officials in such positions as vice chancellor for research, director of compliance, and general counsel.

As the GAO report noted, U.S. export control regulations are designed for “self-compliance.” For the academic community specifically, it is the universities’ responsibility to conduct due diligence to determine whether their research activities are subject to export laws, and to identify whether an export license is required for foreign nationals within their purview. Several university officials told GAO that becoming educated on complex export control regulations requires an extensive time commitment because the government does not provide sufficient guidance. They indicated that the training and guidance conducted by the two Departments (State and Commerce) have limited utility for academic institutions. Indeed, the GAO was not complimentary of either department’s outreach and training, finding that there was not enough of it and that it was not aimed at the academic audience. GAO also found that State and Commerce have taken few actions to coordinate their outreach efforts to universities.

Among the universities GAO identified as sources of “best practices” information on export controls were Massachusetts Institute of Technology, Stanford University, and the Universities of Oklahoma and Maryland.

State Department and Commerce
Department officials expressed concerns to GAO that universities may not be properly undertaking their responsibilities under export regulations, and that the potential may exist for foreign nationals to access sensitive information on U.S. campuses. However, despite these concerns, GAO found that neither agency has analyzed available information on university research and foreign student populations to determine the potential risk of the illegal transfer of controlled information.

GAO did find that the universities were taking steps to comply, or adjust to avoid having to comply, with the export regulations. For instance, most universities extensively review the terms of potential contracts and grants to seek those that do not restrict their ability to conduct fundamental research. Some universities attempt to negotiate out contract language that includes restrictions on fundamental research.

GAO found that universities sometimes modify the way the research subject to export control restrictions is conducted to avoid the export license application process.

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1 Boston University, Boston, Massachusetts; California Institute of Technology, Pasadena, California; Carnegie Mellon University, Pittsburgh, Pennsylvania; Colorado State University, Fort Collins, Colorado; George Washington University, Washington, D.C.; Johns Hopkins University, Baltimore, Maryland; Massachusetts Institute of Technology, Cambridge and Lexington, Massachusetts; Stanford University, Stanford, California; University of California at Berkeley; University of California at Los Angeles; University of Colorado at Boulder; University of Maryland at College Park; and the University of Southern California, Los Angeles, California
For example, officials at one university told GAO that instead of applying for an export license for one project, they opted to use only researchers who are excluded from export license requirements, such as U.S. citizens or foreign nationals with permanent residency status. Other university officials reported that they move export-controlled work to off-campus facilities and laboratories administered by the universities or the entity sponsoring the contract, where such research can be better segregated and controlled. At the six university-administered laboratories that GAO visited, each used access control systems such as badges and computer passwords.

GAO also found that the Department of State does not target universities for compliance and has not visited a university. Similarly, the Department of Commerce does not conduct analyses to determine whether academic institutions that have not applied for licenses are in compliance with export control regulations. Instead, Commerce uses leads generated by intelligence agencies, internal Commerce sources, or the public via a hotline to investigate possible cases of export control violations.

GAO reported that neither Commerce nor State analyzes available federal agency data on university research subjects to identify trends or determine the potential for such research to be subject to export control regulations. The report also took the export control agencies to task for not using data on foreign students’ and scholars’ majors or fields of study to identify potential areas of risk.

The report suggested that the Department of Homeland Security’s Student and Exchange Visitor Information System (a database that tracks student nationality, school enrollment, and changes to major or field of study) could be used to alert the regulators to potential trouble spots. However, GAO noted that, within the past three years, neither State nor Commerce has requested these data from Homeland Security for the purposes of assessing export control risks. Similarly, GAO found that State does not use its Visas Mantis program (a security review procedure that aims to identify visa applicants who may pose a threat to U.S. national security by illegally transferring sensitive technology) to identify trends of foreign students and scholars and their fields of study.

As is often the case with GAO reports, after finding that the agencies involved in managing the process were not doing a very good job, the proposed corrective actions were not particularly oriented toward any actual change. Instead, the report proposed two points for agencies:

- **Strategically assess potential vulnerabilities in the conduct and publication of academic research by becoming more knowledgeable about research being conducted on university campuses and, in consultation with other agencies, make use of available information on technology development and foreign student populations at universities to assess the extent to which research at universities may be subject to export controls, and on the basis of this assessment of university research and foreign student populations, improve interagency coordination, conduct additional outreach, and improve guidance to ensure that universities understand when to apply export controls.**

In its response to GAO’s suggestions, the Department of State noted that it is working
with the Departments of Commerce and Treasury to conduct an export control conference during 2007 specifically aimed at universities.

Universities and other research institutions can expect additional reviews of their export control compliance in the coming months and years. GAO has a semi-permanent team looking into the topic, so they and the regulatory agencies will be back. To avoid being caught unprepared, senior management at all academic institutions should assure that they have a compliance system in place. The policies, practices and methodologies of those “best practices” institutions identified by GAO should serve as a starting point and benchmark for others.
Encouraging the Heart is a fairly quick read, and would be very useful for a casual or “pop” consideration of the human element at the center of management. Research administrators in leadership roles may find this reflectively useful, especially those who, with or without the customary leadership titles, want to make working with people more meaningful, more productive, and more humanly pleasant. An optional workbook is available for those who want to engage in additional, more structured planning. The authors are widely published in the area of leadership, but this book focuses solely on why and how to encourage happier, more fruitful working relationships. Research administrators can be so caught up in rules, regulations, laws, policies, procedures, deadlines, and systems that we forget that at the heart of our business are people. Lots of them. This is about the human side of work.

Part One: Chapters 1-3

Why is it important to encourage the heart? The authors found that most people perform at a higher level when they receive encouragement in the workplace. People obtain a great deal of satisfaction from positive feedback, but most of us do not think we really need it because we are smart, strong and independent. But we do. Simply put, humans are more in need of encouragement than we wish to admit. We work better and accomplish more when we feel good about what we have done. We work harder for people we like, and we like them because of how they make us feel. The authors point out that the highest-performing managers are closer to their workers and more open in sharing thoughts and feelings. Yet many managers still hang on to the old notion that to be successful in the business world, a leader has to be aloof, impersonal, and unemotional. That is not likely to be successful with today’s workers. The word “encourage,” in fact, has the same root as “courage,” and the act of encouragement is not for the weak hearted.

In their observations of effective leadership, Kouzes and Posner have identified seven elements for encouraging the heart: 1) set clear standards, 2) expect the best, 3) pay attention, 4) personalize recognition, 5) tell the story, 6) celebrate together, and 7) set the example. Each of these elements is discussed and described through examples.

Readers can rate their own strengths and weaknesses in encouraging others through use of the Encouragement Index, a tool to rate one’s own behavior numerically. The description of my own score was right on target. The tool provides a glance in the mirror and a point of reference for the rest of the book.
Part Two: Chapters 4-10

Each of the chapters in Part Two elaborates on one of the seven elements identified above. Leaders who encourage the heart set clear standards and then provide equally clear feedback on achieving those standards. This is about goals, but not just the goals themselves. It is also about the underlying values and principles of those goals. If people do not believe in those underlying values, then the job is not a good fit and performance is unlikely to be exemplary. Personal values must match organizational values. This is at least as important as skill sets and it should have an impact on hiring, training, and promoting staff. Once clear standards are set, good leaders can then expect the best of people, and managers who expect success usually get it.

The authors update the 1980’s concept of Management By Walking Around and retitle it Caring By Walking Around (CBWA). This is not aimless wandering. Stopping by a cubicle or an office to check in with a worker is an opportunity to pay attention, to look for examples of success, to get to know the individual. Do workers personalize their work spaces, or are they sterile? What significance might this have for how individuals invest in their presence in the positions they hold? How might this be a clue to my management interaction with this person both for him- or herself and for the mission we are meant to accomplish? Paying attention to what is important in workers’ lives outside of work may be of assistance in understanding how they value what they do inside the workplace.

A leader will encourage the heart by being openly joyful at another’s success, by cheering, by coaching with enthusiasm. In this environment, workers are more likely to help the whole group succeed. Successes should then be publicly recognized and honored. How that recognition occurs should depend on what is meaningful to the person being recognized, not a predictable and stale generic event. How does a manager know what an individual would like? By walking around and talking to people (CBWA)! The celebration of individual and group successes builds a stronger working community.

If leaders are to lead, they must do so by example, by modeling the values and principles of the organization and by valuing the people with whom they work. They must be credible, believable. Kouzes and Posner have found that when workers perceive their managers to be credible, they will have a stronger sense of team spirit, be personally committed to the organization’s values, and have a sense of ownership. When managers lack credibility, workers produce only when they’re being watched or are motivated by money; they tend to criticize the organization and feel unappreciated.

Part Three: Chapters 11-12

The final two chapters provide guidance and ideas for how to encourage the heart. To start, leaders need to find their own voice and lead from their own experiences. All the “right” tools and techniques are not very important if leadership is not authentic or does not make a personal impact on workers. A degree of “clumsiness” will undoubtedly occur. As with any skill, however, leaders can learn to be adept at encouraging the heart with practice. The authors have provided a list of practical ideas to get started. The list is organized by the seven essential elements; some are simple and some are extravagant. The important thing is to get started.
Voice of Experience

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Prelude

The Voice of Experience article in this issue of the Journal of Research Administration on Demystifying the NIH Proposal Review Process by Dr. Victoria Molfese, Mr. Joseph Cervelin, and Dr. Pamela Miller is both timely and informative for researchers and research managers. The article sheds light on the National Institutes of Health (NIH) review process at a time when competition for NIH funding is more acute than it had been just a few years ago. NIH funding, following the doubling of its budget between 1998 and 2003, has been relatively flat. When one considers the impact of the biomedical price index, an inflation factor, NIH funding in real dollars has decreased. This is occurring at a time when the number of applicants is expected to increase from about 27,000 the last year of the NIH budget doubling to about 37,000 in 2007. Nearly 50,000 applications are anticipated in 2007, about a 40% increase since 2003. The result is that funding levels that once were in the mid 30th percentile range are now in the 10th percentile range for some institutes. While there is a slight increase in NIH funding in 2007, opportunities remain very competitive and any advantage an investigator can gain is helpful.

A clear understanding of the NIH peer review process is crucial to an applicant’s success today – a proposal should be written with the “audience” in mind, so that the clearest possible case for the significance and promise of the proposed research can be made. Many applicants, particularly young investigators for NIH funding, are not aware of the review process. The article by Molfese et al. clearly and concisely describes the workings of an NIH study section. The article discusses the selection of study section members, the assignment of reviewers, what primary and secondary reviewers must do in preparation for the study section meeting, and the factors that can affect a proposal’s success during the study section review. Of particular interest, the article addresses the discussions and personal interactions that occur among reviewers.

It has been stated that the peer-review process is an imperfect process. Molfese et al. confirm that reviewers sometimes do bring their biases into the review process, and there can be honest disagreements among reviewers. The authors also acknowledge that, on rare occasions, reviewers may utilize ideas they have
obtained from the review process. However, despite these occasional lapses in professionalism, the peer review process remains the best mechanism for evaluating proposals seeking funding for biomedical research.

The questions asked by Dr. Miller and Mr. Cervelin are drawn from their experiences in facilitating proposal development and preparation. This question-and-answer approach yields information that can be used by both researchers and research administrators. Research administrators’ knowledge about the peer review process can help them provide valuable advice to investigators on selecting NIH funding mechanisms, requesting specific study sections, and preparing successful proposals. In addition, research administrators, especially post-award and fiscal administrators, may have occasion to participate in NIH review teams during on-site visits or reverse-site visits of major program grants, such as specialized centers of research. Knowledge of the NIH review process, as well as budgeting, fiscal management, and compliance regulations, can make this review process go more smoothly.

Dr. Molfese’s experiences as an NIH-funded researcher, reviewer, and research administrator provides a unique experience to the discussion of NIH peer review. As a researcher, she has applied for funding, but as she states, she has also learned a great deal from participation as a reviewer. She acknowledges that it is hard work. However, being a reviewer is something that all funded investigators should do as a service to the system that has supported their research activities.
Demystifying the NIH Proposal Review Process

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Introduction

Victoria J. Molfese, Ph.D., holds the Ashland/Nystrand Chair in Early Childhood Education in the University of Louisville’s Center for Research in Early Childhood. Prior to this appointment, Dr. Molfese served as Director of the Office of Research Development and Administration at Southern Illinois University for 13 years and was a member of the Psychology faculty. She was elected President of the Society of Research Administrators International in 1998 and has held SRA’s Distinguished Faculty designation since 2002.

Dr. Molfese’s research focus is on how children learn and factors that influence learning, such as children’s home environments and family background characteristics; how schools, teachers, and curriculum influence learning in preschoolers; and how to assess evidence of learning in children from infancy through early elementary grades. Her research has been supported by grants from private and government agencies, including the March of Dimes, the National Institutes of Health (NIH), and the U.S. Department of Education’s Institute of Education Science (IES).

She has served as a peer reviewer on several study sections, including review panels for the IES, NIH, NIMH (National Institute of Mental Health), the International Dyslexia
Association, the National Foundation/March of Dimes, Networks of Centers of Excellence of Canada, the Ontario Mental Health Foundation, and the U.S. Department of Agriculture.

In this article, Dr. Molfese answers a series of questions developed by the co-authors to reveal the interpersonal dynamics of an NIH study section and the nitty-gritty details of how an NIH proposal is reviewed. Dr. Molfese’s “voice of experience” as an active researcher and distinguished research administrator provides a candid insider’s view of this often mysterious process.

**Question:** You have served as a principal investigator (PI) as well as a research administrator (RA). How do these two roles differ?

**Answer:** PIs are in charge of conducting a research project over which they usually have quite a bit of control – after all, they designed the project and now have a chance to conduct it using grant funds. While all projects involve unexpected events – nothing ever turns out as perfectly as we think it will – most projects tend to involve components that the PI has done before (possibly on a smaller scale) and, therefore, most of the components are familiar. An RA depends on others – PIs or prospective PIs – to set job duties in motion. Because there appear to be endless variations (or variants!) of PIs, RAs encounter projects that often are completely unfamiliar to them. Even projects that could be familiar have PIs who put their personal spin on the project, which tends to make the familiar once again unfamiliar. RA and PIs have to learn to work together with their different motivations. The RA wants to get the proposal submitted to the agency with all compliance issues resolved in plenty of time to make the deadline, while the PI wants to continually rewrite the proposal until the last possible minute to get it perfect before the submission deadline, with no worries about compliance issues.

**Question:** When did you begin reviewing proposals for the NIH?

**Answer:** I began reviewing in 1994, at the suggestion of a friend. I had been asking questions about how people became reviewers and learned that a person can ask NIH to consider them as a possible reviewer. So, I sent my vita and a letter of interest to my program officer, and he contacted me to be part of a standing study section dealing with projects related to childhood development.

**Question:** How did you get selected to serve as a peer reviewer for NIH?

**Answer:** After the initial time I requested to be a reviewer, I found that I was asked by other agencies and other branches of the same agency to be a reviewer for their proposals. Clearly, there is a mechanism by which reviewers are “shared” by program officers and scientific review administrators (the people who lead the proposal review sessions). One program officer told me that she had worked with a federal grants program where the program officers provided a written evaluation of each reviewer, and that served as a basis by which people were asked to be or not to be reviewers in the future. Imagine that -- reviewers being reviewed! This may be why some people appear frequently as reviewers, but another explanation is that people with grants and people who have strong research credentials in a particular field (based on publications and reputation) often are asked to be reviewers.

**Question:** What were your specific responsibilities as a peer reviewer?

**Answer:** In each case, I was given as
many as 10 proposals to read and a set of guidelines against which to produce a written review. Most agencies have fairly similar guidelines – they ask about the significance of the project (how will the project contribute to the solution of a problem that agency is interested in or move a field of science forward?), the soundness and feasibility of the study design, the ability of the PI and other key project personnel to execute the project, the reasonableness of the budget, and the extent to which human subject protections are in place. Usually proposals are mailed to the “primary” reviewers (usually there are 2 to 3 per proposal) with between 2 to 4 weeks before the study section is scheduled to meet. The primary reviewers are assigned to proposals by the scientific review administrator of the study section based upon the expertise needed to cover certain aspects of the proposal (e.g., content, methodology, or statistics). Before the scheduled meeting, written reviews and preliminary scores for each proposal have to be posted to a website by each of the primary reviewers. At the scheduled meeting, primary reviewers each summarize their reviews of each proposal and discuss its strengths and weaknesses. After the discussion, all the reviewers (those assigned as primary reviewers of a proposal and other reviewers on the panel) discuss the proposal and provide an overall vote on the proposal.

**Question:** Do NIH peer reviewers get paid to review proposals? How much? If not, why do people do it?

**Answer:** Yes, they do get paid. NIH pays $200 to 300 per day plus a fixed per diem rate, and transportation; they cover hotel nights directly. IES pays $2,000 for the review, certain per diem costs, and transportation, and they also cover hotel nights directly. The pay does not offset the time-consuming and pressured nature of the review process. However, the non-monetary payoff is that reading proposals can be interesting and educational, plus the other reviewers are very interesting to get to know.

**Question:** Where does the peer review take place?

**Answer:** Review meetings are almost always held in Washington, DC for federal agencies. Occasionally, when agencies conduct site visits to large program grants, the review takes place where the program grant is sited (e.g., New York City). But site visits occur rarely now (too expensive) and agencies usually have review sessions where they are located (usually Washington, DC). Sometimes reviewers don’t have to be physically present at the review – they can do a phone review. This is done when the reviewer can’t come or only has 1 or 2 proposals to review. I have also done a review in an airport hotel, which was very convenient for a large group of reviewers and program people flying in from different cities.

**Question:** How many proposals are you required to review?

**Answer:** As many as they send you! On average, I receive around 10 proposals, but occasionally I only have 1 or 2 (and then I can usually do a phone review). Sometimes, with triage in which the proposals with poor scores are not discussed, I will only have a few proposals that are actually discussed at the review session, but I still have to provide the full written review and evaluations for all the proposals. (Note: A triage occurs when a proposal is reviewed by the 2 to 3 “assigned” reviewers with a preliminary numerical score of >2.5, on a 1 best to 5 worst scale. Proposals with a score greater than 2.5 by the primary reviewers...
are rarely if ever competitive for funding, and therefore, they are not discussed during the limited study section meeting time. Those proposals do receive the full written comments by the reviewers. If the assigned or other study section reviewers request it, a >2.5 proposal may still be discussed, but I have never seen one receive a competitive score after the discussion. Usually there is at least one fatal or near-fatal flaw with the proposal.

**Question:** How many peer reviewers are there for each round of proposals?

**Answer:** The number varies depending on how many proposals were submitted, the areas of expertise that need to be represented by the reviewers, and the complexity of the proposals. Usually there are 20 or more reviewers present at the review meeting. Because the meetings are held in hotels, and meeting rooms seem to be at a premium, reviewers often are sitting shoulder to shoulder around tables arranged in a large square with the center open (like a square donut). In the center of the square are boxes into which the proposals are tossed by reviewers after they are reviewed (along with any other confidential materials). The agency shreds the materials in the boxes after the review. Many reviewers bring their laptop computers and use them to follow along on each proposal reviewed. The laptop phenomenon has created the need for massive numbers of power strips, usually duct-taped to the table tops, so that people can plug in computers. While the primary reviewers still get paper copies, all the other people at the review session get electronic copies on disk. Therefore, it is important to have a laptop. It is very crowded in those little rooms.

**Question:** What are the social/power dynamics of the peer review process?

**Answer:** Actually, proposal review sessions are fun as well as anxiety producing. The other reviewers are a mix of people – some you know, some whose research reputation you know, and some who are total strangers. Some are peers in terms of age and experiences, some are new researchers/scholars, and some are emeritus but still active scholars. At the beginning of the review, the scientific review administrator explains the rules of how the review will proceed, and identifies which proposals have received low initial scores and which will be triaged unless any one reviewer wants to keep the proposal in for discussion. Reviewers introduce themselves, and then the proposal reviews begin. It is often an awkward or stiff process at first because people are self-conscious. These first proposal reviews take the longest (sometimes 30 minutes or more), but the process picks up speed as people relax and get familiar with the procedure. I was at a review session recently that worked great – each of the 2 or 3 reviewers summarized their review and tried not to repeat what the others had said, the critiques were interesting, and none of the reviewers seemed to have a big ego. Reviewers differ in how they deliver their critique – some can be arrogant and appear to try to “score” points by noting weaknesses in proposals, some note weaknesses but also note strengths, and there are a few whose reviews are not very informative, which may be because the topic of the proposal is not in their area of expertise or because they haven’t reviewed the proposal very thoroughly. Some reviews are extremely interesting: for example, giving information on historical perspectives on a field or a method that helps put the proposal in perspective (sometimes not in a good perspective because some PIs do not know or reference previous work well and their
proposals may duplicate others or may be flawed due to a lack of understanding about what has already been done).

**Question:** Have you ever seen competitiveness, jealousy, revenge come into play during the review process? How was this dealt with?

I have seen all of those, but not often. Sometimes reviewers really want a certain proposal to succeed or fail depending on the topic, the research design, or the PI. For example, one reviewer clearly had a grudge against a particular methodology, and each time a proposal was discussed using that methodology, the reviewer ranted about its weaknesses. Because there are 2 to 3 reviewers, one person’s opinion does not usually sway the entire discussion – even if the reviewer is forceful in tone and behavior during the review. Other people on the study section also wade in with their comments, either supporting or not the forceful reviewer’s comments. Often the program officer, the scientific review administrator, or someone else from the agency who is observing the study session will speak up if the behavior or topic of discussion is going in the wrong direction. For example, comparisons of one proposal against another are not allowed; trying to design a study for a proposal whose design is weak is also not allowed. In general, reviewers do not seem to be intimidated by other reviews, possibly because they tend to be very accomplished in their own right.

**Question:** What role does the NIH staff play, if any, during the peer review process?

**Answer:** The staff serves as observers, so they have no interactive role. However, they can comment when there are questions about the intent of an RFA/RFP or an interpretation of a component of the RFA/RFP or agency priorities or intentions. They also make sure that the review follows agency guidelines. The scientific review administrator is supposed to determine the order in which the proposals are reviewed (usually based on when the program officers can be present in the room to hear the review or when the reviewers can be at the review; some come late or leave early or do phone reviews). The scientific review administrator ensures that the reviewers have all the proposals and supporting materials they need to accomplish their tasks, that scores are provided, that compliance issues (e.g., human subjects) are discussed, and that score sheets are signed by the reviewers and turned in at the end of the study section.

**Question:** Describe an average review session – the trajectory of one proposal over the course of time and/or a series of reviews in one session.

**Answer:** In the typical review session, each proposal has an order in which it will be reviewed – this may change depending on the presence of reviewers or program officers – and the reviewers of the proposal have an assigned order (primary, secondary, or tertiary). First, each of the reviewers give an overall evaluation score of the proposal (from 1 to 5, with 1 being highest). Then, the first reviewer gives a general summary of the proposal followed by a critique that includes comments about the significance, research plan, and personnel. Then the second and third reviewers give their reviews, which ideally add to rather than repeat comments made by Reviewer 1. Following these critiques, there is a discussion by the full study section. Often the discussion involves exchanges between the assigned reviewers with each other more so than between the other reviewers, but I have seen extensive discussions involving
multiple assigned and unassigned reviewers. After all the reviews and the discussion are completed, the budget and any human subjects concerns are discussed. Then all of the reviewers vote.

**Question:** What is the most unusual/memorable proposal or review session that you’ve encountered?

**Answer:** A recent study section in which the reviewers, right from the beginning, just seemed to be in sync with each other. The reviews of each proposal fit the expected process of the first reviewer doing the summary and subsequent reviewers adding to what was said, followed by a discussion of the key elements of the proposed study/studies within the proposal with regard to what is currently known in the field and what needs to be known and how. Sometimes I learn a lot about research methods, knowledge in the field, or statistics from proposal reviews; in this study section I learned a lot. Plus, the reviewers were interesting and friendly people, none of whom I knew before the review. The review meeting actually ended early (around noon) the second day rather than late in the afternoon of the second day, as is typical.

I also have been at sessions where a PI requested that a reviewer NOT review the proposal or be present during the review. The reviewer was shocked to be excluded and complained openly. That is both memorable and unusual.

**Question:** What are your pet peeves as a proposal reviewer relative to proposals and the peer review process?

**Answer:** I have several! First, sometimes writers attempt to “instruct” the reviewers with statements such as, “the reviewer may be wondering...” or “the reviewer should be very careful to note...” Such statements, or their tone, are not appreciated. “Instructing” reviewers wastes precious text space that could be used for elucidating critical elements of the proposal. Second, although the application may request the same or similar information in different parts of the proposal, using whole paragraphs or sentence strings verbatim in multiple places within the proposal will annoy most reviewers. Third, some proposals are poorly prepared, and the reader wonders why she or he is wasting time reading a document that the writer has not carefully read. Examples are misspellings, ungrammatical sentences, text with missing words, and references to graphics or appendix materials that are missing. These proposals create poor impressions and raise questions about how carefully the applicant conducts research. Fourth, references that are cited in the text but missing in the reference list are irritating. I have read proposals where the reference list and the references in the text were misaligned – possibly because the references for the proposal had been taken from another unrelated document and references in the text were not in the list of references and vice versa. It is important for writers to know that reviewers are not experts in all areas (certainly I am not!). Reviewers look up references and read articles to gain at least some expertise. Finding articles can be a very easy process now, using search engines which allow immediate access to articles and chapters. When key references are missing or incomplete, the reviewer is peeved.

I also get peeved when reviewers try to gloss over an incompletely developed proposal submitted by a well-known researcher that they would not be willing to gloss over in a proposal submitted by an unknown. Most other reviewers also tend not to accept statements such as “Dr. X surely knows how
to conduct this research even if he/she does not include all the details in the proposal.”

**Question:** How might your prior knowledge of the PI and his or her work influence the way you review a proposal?

**Answer:** The reputation of the PI does have an influence – but it might not be consistent. Well-written proposals with clearly designed research and with aims directed at critical issues in the field tend to get funded, usually regardless of the PI’s reputation. I am not impressed when senior researchers refer to their previous work without giving examples, or refer to a methodology they use without giving details, or seek to move into new areas of research where they have no expertise, expecting the reader to predict the quality of their work in that new area from their work in another area. There is an undeniable tendency to allow some “credit” for well-known researchers, but the proposal still needs to be competitive, which means: good ideas that are well articulated in writing and studied using well-designed procedures.

**Question:** When would you recuse yourself from reviewing a proposal? A proposal submitted by someone you know professionally? Socially? Someone you had the opportunity to meet at a conference?

**Answer:** I would recuse myself from reviewing proposals when there is or could be a perceived conflict of interest – for example, in cases where I am working with someone (whether at my institution or another institution), or have a close professional relationship with someone. However, simply knowing people or socializing with people shouldn’t result in a reviewing conflict, as these are commonplace occurrences. Indeed, part of “continuing education” for researchers involves getting to know people to discuss research ideas and ask questions about research methods, analyses and interpretation. Contacts are made by phone and e-mail, and at conferences and meetings. If reviewers were excluded from study sections or proposal reviews because they were acquainted with other researchers, there would be few people left to review.

**Question:** Is it always good to present a positive image to the reviewers? When do you feel “confidence” crosses the line and becomes pretension/pomposity?

**Answer:** There are all sorts of people in research (as in any field). Personalities and demeanors vary widely. I have a difficult time interacting with people whose style tends toward lectures rather than an exchange of ideas and opinions. Collegiality and good manners usually define the line for me.

**Question:** Have you ever been impressed or especially moved by a proposal that you have read? What touched you?

**Answer:** Proposals are hard to write and when I run across a well-written proposal, I am impressed. “Well-written” is defined for me as starting with a clear set of goals or aims, setting forth convincing research evidence for the importance of those goals for moving the field forward or solving an important problem, and then proposing a methodology that should produce the data needed to address the goals or aims. I have read many proposals, and only a few have been really well written.

**Question:** Have you ever regretted any decisions you’ve made or actions you’ve taken relative to reviewing a proposal? What did you regret about your actions and why?

**Answer:** I sometimes have second thoughts, particularly when I believe that a proposal
should get a poor evaluation. That happened recently when I evaluated a proposal as extremely poor science. I was worried that my review might be harsh or out of line with the other reviewers. I carefully wrote my review, read it over several times before the review (and several times after the review was all over), and felt that the statements written were accurate and fair.

The other reviewers were also negative. One was less negative than I was, and the other very similar to my evaluation. I have given negative evaluations before, but for this proposal there were many negative things to write about. I think I worry more about the reviews of proposals that lead to negative evaluations than those that receive positive evaluations. For this reason, I usually read through all the proposals I am sent, making notes on each one. Then I read each proposal again and write the review. During the writing process I will often look up references and read articles, and I frequently check out methodologies and proposed data analyses to make sure that I understand what is being proposed. When I am finished writing the review, I may read it several more times before I submit it as “final.” I do this for all proposals, not just the ones that I give negative reviews, but I pay particularly close attention when writing negative reviews.

**Question:** Have you ever felt that other reviewers had ulterior motives and secret agendas that influenced the way they reviewed a proposal? What can other reviewers do when this happens?

**Answer:** Occasionally one reviewer will be so different in his or her evaluation of a proposal that the review stands in contrast with that of the other reviewers. Sometimes these reviewers try to force their opinions about the proposal in an effort to change the evaluations of others. However, reviews are fundamentally evaluations of proposal elements and a careful reading of what is actually written in the proposal. Some reviewers will acknowledge that a proposal is missing or has confusing elements, but dismiss those weaknesses by indicating what they believe should have been included or what the writer meant to include. Sometimes the dissenting reviewer has special knowledge – methodological expertise relevant to the proposal’s design or content knowledge relevant to its topic – and they can elucidate components that might not be clear to other reviewers. However, with multiple reviewers on each proposal as well as a large study section composed of many reviewers, it is not likely that a single strong-willed reviewer can use a biased evaluation of a proposal that is at odds with the evaluations by other reviewers to radically change the overall evaluations of the proposal.

**Question:** Do peer reviewers ever “steal” ideas from the proposals they read?

**Answer:** I have heard of this happening and one PI showed me an instance in which this has occurred, but I do not believe that it happens very often. Certainly I have not heard many complaints about this. In everything that is published or becomes “public” through a review process, there are opportunities for ideas to be stolen. However, it is common in science for people to be researching exactly the same thing using the same methods and publishing the results of their work. I believe that the researcher’s “know how” separates the original from imitations.

**Question:** How does the review process work when there are disagreements among peer reviewers?

**Answer:** There are often disagreements, and those are allowable. People interpret proposal elements differently, or evaluate the
significance of a weakness in the proposal differently. The scores given by individual reviewers can range broadly across the reviewers assigned to each proposal and across the reviewers at the study section who also vote on each proposal. The purpose of the discussion following the reviews of the proposals by the reviewers assigned to each proposal is to discuss differences of opinion and interpretation. Sometimes these discussions result in the reviewers coming closer together in the scores they assign to the proposals, but not always. The evaluation scores of the proposals are given by the assigned reviewers publicly during the meeting first, just before the actual review of the proposal, and then again after the proposal has been reviewed. Making the reviewers’ scores public during the meeting tends to keep reviewers honest. In addition, other people at the review are asked to vote within the range of scores stated by the assigned reviewers (such as between 1.8 and 2.3) or to give their reasons if they decide to vote outside that range. This “out of range” voting occurs sometimes when reviewers differ in how they view a particular element, such as the importance of using a new technique to gather data or using a standard technique.

**Question:** How has serving as a peer reviewer for NIH helped you professionally?

**Answer:** I have learned a lot about proposal writing, research methods, and child development, my area of scientific expertise. I have also met and spent a lot of time with a lot of people. I have read a lot of research articles referenced in proposals, and participated in a lot of review sessions. I hope it has all resulted in me being a better and more informed researcher, as well as being a good reviewer. However, getting funded is very difficult. My proposals still get triaged, low scores, and occasionally fundable scores resulting in grants. With all that experience I still don’t have the key to consistent success.

**Question:** How would you advise other faculty members who are interested in serving as a peer reviewer for NIH to proceed?

**Answer:** I would encourage them to do what I have done. Use the NIH webpage to identify the study section that has proposal solicitations in areas of their expertise, review the list of the current study section members to see who they are and what their areas of expertise are, identify the scientific review administrator associated with that study section, and send an e-mail stating an interest in proposal reviewing, and attach a vita. It is important that faculty and researchers interested in reviewing have publications that indicate their areas of expertise, and it is beneficial if they have written proposals that have been funded, whether by NIH or another agency. NIH is looking for reviewers, and contacting the agency directly is a good way to be considered.
CRA Review sessions are currently scheduled at various U.S. locations.

Check www.cra-cert.org to find a session near you.
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