Medical Center

Plan for
Integrated Advanced Information Management Systems
2002-2007

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UC Medical Center Plan for IAIMS (Published 3/02; revised 5/02) 1
IAIMS Planning

History of IAIMS at UC and Current Planning Efforts

The University of Cincinnati Medical Center spent much of the 1980s engaged in IAIMS, securing planning and modeling grants under Nancy Lorenzi, PhD. It failed to obtain an implementation grant largely because of inadequate technology and because informatics was too decentralized for coherent institutional effort. The 1990s were spent implementing organizational change, improving technology infrastructure, expanding research capabilities, strategically planning for the new millennium, and planning for the next wave of research expansion catalyzed by the doubling of the National Institutes of Health budget. In 2002, with many of these initiatives coming to fruition, the Medical Center is poised to reinvigorate a formal IAIMS effort. For more information about the Medical Center and its colleges and major units, see Appendix 2.

In spring 2001 the Senior Vice President and Provost for Health Affairs, Donald C. Harrison, MD, brought together key leaders from the Medical Center to discuss whether we were now positioned to fully implement IAIMS. The answer was a unanimous “yes.” Dr. Harrison formed an IAIMS Steering Committee, which he chairs, to oversee the process and develop an IAIMS grant proposal. Members of the committee represent faculty, students, and administration, including the deans or deans’ representatives of the Medical Center’s four health professions colleges. The overall purpose of the planning process was to identify the key information problems – current and of faculty, staff, and students and to construct strategies to address them.

This plan is the result of the efforts of the IAIMS Steering Committee, the task forces it charged to develop specific parts of the plan, and the faculty, students, and administrators who are members of existing groups, committees, and programs that provided broad input on needs and helped to define a vision of knowledge management. It will serve as the foundation for an IAIMS operations grant proposal and as the Medical Center’s strategic plan for information management through 2007.

Nancy Lorenzi, PhD, Assistant Vice Chancellor for Health Affairs, Vanderbilt University, and Daniel Masys, MD, Director of Biomedical Informatics, University of California-San Diego, provided consultation during our planning process.

Organizing for IAIMS Planning

In 1996 Dr. Harrison formed the Integrated Information Steering (IIS) Committee to develop an information vision and standards at the Medical Center and among its partners, including the University of Cincinnati and the Health Alliance of Greater Cincinnati, the consortium of hospitals of which University Hospital is a member. The activities of the IIS are “iaims” in nature. The IIS facilitates the development of integrated systems across the Medical Center and its partners whenever possible. The
IIS also continues to evolve its vision of information management by keeping current with national and global trends.

The IAIMS Steering Committee intensified the work of the IIS. It began the planning process with a focused review of the IAIMS, information management, and knowledge management literature. It intensively assessed the major global and national issues based on the literature, and then charged three task forces to address key planning issues. The task forces included:

- Information Technology and Resources Self-Study
- Information Management Needs
- IAIMS Implementation Plan.

The purpose of the Steering Committee and task forces, their membership, and the existing committees, organizations, and programs that participated in the planning process, are outlined in an attachment at the end of this plan.

**IAIMS Planning Scope**

The Medical Center is a large, complex organization consisting of the College of Medicine, College of Nursing, College of Pharmacy, College of Allied Health Sciences, Hoxworth Blood Center, UC Physicians (the College of Medicine’s faculty group practice), Academic Information Technology and Libraries, and various support and administrative units. On January 1, 1997, University Hospital, formerly a part of the Medical Center, became a private, non-profit entity separate from the University and a founding member of the Health Alliance of Greater Cincinnati, the region’s largest health system. Since then, the primary mission of the Medical Center has focused on education, research, patient care, and community service, but not hospital services. The Medical Center, however, continues to have many direct and indirect links to its major teaching hospitals – University Hospital, Cincinnati Children’s Hospital Medical Center, Veterans Affairs Medical Center, and Cincinnati Shriners Hospital. IAIMS planning centered on the Medical Center’s education and research missions. See Appendix 2 for descriptions of Participating Institutions and Organizations.
IAIMS Guiding Principles

The IAIMS Steering Committee developed the following guiding principles for the planning process. IAIMS planning and implementation must:

1. Support the Medical Center mission and its strategic plans for research, education, and patient care.
2. Be realistic, challenging, and measurable, acknowledging that universal solutions are ideal but sometimes not attainable.
3. Focus on areas that meet future needs, that will contribute to our knowledge management vision, and that are scalable and replicable.
4. Take advantage of existing technology, data and information sources, and expertise throughout the university and beyond.
5. Continue and expand collaborations.
6. Build on the culture, developed over the last fifteen years, of openness, trust, and doing the right thing.
7. Use experimentation, testing, and modeling to prove concepts, followed by implementation of the successes in ways that can be scaled and replicated.
8. Employ “build vs. buy” analyses on all new systems, including cost/benefit and risk/reward evaluations.
9. Develop standards through consensus with as little limitation as possible of freedom of expression and creativity.
The IAIMS Steering Committee believed completing a self-study of the Medical Center’s information technology resources and capabilities was an important first step in the IAIMS planning process. The purpose of the self-study (see the entire self-study in Appendix 3) was to create a baseline understanding of our current status of information technology and information management resources, which would be followed by an analysis of information needs (see the next section of this plan).

The self-study is organized into eight categories, which are represented as tiers within an information management “architecture.” The self-study’s diagrams illustrate this architecture. Each tier has a link or relationship with the layers immediately above and below, and in many cases with other tiers as well. The narrative describing each tier includes a listing of components (for example, in the software architecture tier, all software packages used for development) with descriptions and linkages to other tiers. The tiers of the self-study are:

- Customer Access, Resources and Services
- Applications
- Software Architecture
- Databases
- Servers
- Directories
- Network Architecture
- Information Policy

The Information Technology and Resources Self-Study Task Force, co-chaired by Leslie Schick, MSLS, Director of Library Services, and Ralph Brueggemann, MBA, Director of Systems Development and Maintenance, Academic Information Technology and Libraries, was charged to compile the information in an understandable manner. With the help of many others, mostly members of numerous participating committees, organizations, and programs, this task force gathered data, designed diagrams, and compiled the self-study narrative and analysis for seven of the eight tiers.

For the information policy tier, the task force drew from the existing work of the University’s Computer Policy Task Force, chaired by Mitchell McCrate, JD, General Counsel of the University. This task force, which started in 1999, wrote the university information policies appended to the self-study and developed the IT Policy checklist, also appended to the self-study, that identifies policies that should be addressed by individual units and university-wide policies that will be developed in the future.
Information Needs

The Information Needs Task Force devised a four part process to determine the Medical Center’s information needs and most important information problem:

1. Examine existing needs assessments for current information needs;
2. Analyze information needs based on strategic visions;
3. Determine strategic information needs based on 1 and 2;
4. Define our main information problem(s) revealed through analyzing the strategic information needs.

Current Information Needs

The Medical Center and the University engage in continuous needs assessment and quality improvement. The results of the following activities were examined for relevance to an overall assessment of information needs.

- The university contracted in 2001 with PlanetFeedback, a private, local firm and national leader in Internet-based consumer-to-business communications, to continuously assess faculty, staff, and student opinions of university services.
- UCit (UC Information Technology headed by the vice president for information technology and CIO of the university) contracted in 2001 with the UC Institute for Policy Research to survey faculty, staff, and students about their information technology needs and satisfaction with current services.
- The Information Needs Task Force and other IAIMS Steering Committee members met with representatives from the participating committees, organizations, and programs listed in the Task Force’s description in the “IAIMS Planning” section of this plan.
- Medical Center Academic Information Technology and Libraries conducts biennial customer surveys to assess needs and performance.
- Medical Center Academic Information Technology and Libraries has held biennial retreats with Medical Center administrators and college deans and associate deans to assess needs and regularly update the Medical Center’s strategic vision for information technology. See Appendix 4 for Information Technology Retreat Summaries.
- The Medical Center Integrated Information Systems Steering Committee was formed in 1996 and continues to the present to define needs, develop standards, and refine our strategic vision.

Strategic Visions

In addition to continuously assessing needs, the Medical Center and its components engage in continuous strategic planning, projecting future needs. The projected needs revealed through strategic planning efforts, combined with known current needs, provided the IAIMS planning process with a rich base of information from which to define our major information management problems and develop an approach to
addressing those problems. A brief summary of our strategic planning efforts that enriched the IAIMS planning process follows.

Strategic planning for research, driven by the five-year doubling of the NIH budget, has been a Medical Center-wide activity. Expanding entrepreneurship among faculty also has benefited from Medical Center-wide planning. Educational and curricular planning, on the other hand, is mostly college-specific. Each college has developed its own academic plan. UC Physicians, the College of Medicine’s faculty group practice, continuously engages in planning to deliver healthcare in a very competitive environment. Academic Information Technology and Libraries publishes an annual strategic plan. All the plans listed below establish the framework for the Medical Center’s IAIMS proposal to advance its management of information. The plans, with the exception of the last one listed, are attached in their entirety in Appendix 5.

**Medical Center Millennium Plan**
The Millennium Plan is a roadmap for the development of the Medical Center’s research enterprise for the next five years. Among its goals are:
- Strengthen or establish research cores to assure researchers access to state-of-the-art technologies
- Advance the biomedical industry in Cincinnati by commercializing research findings
- Create a Research Institute as a joint venture between the University and industry
- Double externally-funded biomedical research by 2006.

The Millennium Plan also states that, “In addition to the emphasis on bioinformatics, biomedical engineering, genomics, proteomics and environmental sciences, which are included in the Millennium Plan, efforts should also be devoted to developing critical masses in photonics and nanotechnology."

**University of Cincinnati Entrepreneurship Strategic Plan, 2002**
The Medical Center catalyzed entrepreneurial activities by appointing an assistant senior vice president for entrepreneurial affairs in 2001. This strategic plan outlines the goals and objectives for making the University a national leader in the commercialization of basic and translational research.

**College of Allied Health Sciences Strategic Plan, 2001-2006**
The College of Allied Health Sciences, the Medical Center’s newest college (founded 1998), developed a Strategic Plan with objectives covering education, research, and technology.

**College of Medicine Academic Plan, 1998**
The College of Medicine Academic Plan focuses on a vision for medical education, but also outlines goals for graduate education, the physician scientist (MD/PhD) program, and research.
College of Nursing Strategic Plan, 2001-2004
The College of Nursing Strategic Plan is an action plan for education and curriculum development, research, outreach, and patient care.

College of Pharmacy Strategic Plan, 2005
The College of Pharmacy Strategic Plan is its five-year strategic plan that addresses graduate programs, research and scholarship, academic professional education, support systems, and partner relationships.

UC Physicians Business Plan, 2003
The UC Physicians annual plan primarily addresses the low reimbursement issues of the region, the expansion to University Pointe north of the city, and developing systems and web sites for business operations and marketing.

Academic Information Technology & Libraries Strategic Plan, FY2002-FY2004
Academic Information Technology and Libraries (AIT&L) has “lived” the IAIMS principles of integration and “one stop information shopping” for many years. AIT&L published its first strategic plan in 1995. AIT&L updates its strategic plan annually based on customer feedback and structured retreats.

University of Cincinnati Mission Continuity Plan, 2002
The University of Cincinnati embarked on a comprehensive, university-wide Mission Continuity Planning effort in 2001. Mission continuity is the advanced planning and preparations that are necessary to identify the impact of potential losses; to formulate and implement viable response strategies; and to administer a comprehensive training, testing, and maintenance program.

Information Technology Standards, 1997
The Integrated Information Systems Committee, formed by Dr. Harrison in 1995, published these Standards in 1997. The Committee, with representatives from the University, the Medical Center, and the Health Alliance of Greater Cincinnati, established standards for networks, relational databases, office applications, desktop equipment, servers, and operating systems. It also projected a seven year vision that culminated in beginning knowledge management development in 2003. See Appendix 7 for this document.

Strategic Information Needs
The Information Needs Task Force evaluated the needs expressed in existing surveys and by many groups throughout the Medical Center, and analyzed the strategic visions discussed above for future information needs. The following needs, pointing more to the future than looking at the present, emerged as the most significant. Nearly all cross the traditional academic medical center “silos.” The Medical Center is committed to funding, or to securing the funding, to develop each. Plans exist for each, and in many cases considerable progress has been made to fulfill the need. The discussion of each need concludes with a projection of how we plan to fund it.
Clinical Skills Training

Students in our health professions colleges are expected to develop the knowledge, attitudes, and skills necessary to be competent practitioners. Objective documentation of knowledge has been the focus of most educational programs, largely through traditional written examinations, including capstone examinations required for licensure. Although evaluations of student achievement occur throughout the curriculum, documentation of the acquisition of clinical skills and demonstration of appropriate professional attitude using objective evaluations has proved difficult. Most colleges have incorporated standardized patients and case based teaching exercises to demonstrate the acquisition of clinical skills.

All four colleges at the Medical Center have developed clinical skills teaching laboratories (for example, http://www.med.uc.edu/clinicalskills/). Over $2 million has been invested in these labs in the last two years. These labs focus on teaching the skills that students must have before interacting with patients. Standardized patients or cases are sometimes used in conjunction with videotaping of encounters to allow the instructor and student to critique the student's performance. Objective standardized clinical examinations have been used to evaluate student performance in the taking of a patient’s history, in conducting the physical examination, and in developing a treatment plan. Residents and some students use actual clinical experiences in their training. The most critical need now is to manage the vast amount of information generated by clinical skills training and required for assessment and credentialing.

The current assessment process is mostly dependent on paper systems. It provides limited opportunities for evaluation over time. Individual evaluations represent single measures of performance, occur at the end of the term, are not indexed electronically,
and are not available for faculty and students to review later in the curriculum. In some instances, learning objectives have not been developed and or matched to student activity. Feedback on performance and achievement is usually delayed until the paper assessment is complete, at the end of the term.

Our vision sees the clinical skills of residents and students from the colleges of medicine, pharmacy, nursing, and allied health sciences evaluated and documented on a continuous basis with feedback to identify opportunities for self-improvement. A multimedia repository would include pictures, audio, video, written text, and other structured data documenting student performance. These “portfolios” would contain formative and summative information about clinical knowledge and skills. Instructor feedback and student remediation would be almost immediate. For optimal use, the portfolio must be available via wireless personal digital assistant devices, the use of which is being expanded under the leadership of the Distributive Learning Collaboratory (see Appendix 8 for a description of the Collaboratory). Development of a digital “portfolio” for clinical skills training will be supported by grants and college operations.

Bioinformatics

The Medical Center’s research future lies in genomics and proteomics. To be a national leader, bioinformatics support of researchers and the education of students in bioinformatics are critical. Based on these needs, the Medical Center has progressed on several fronts. A new Department of Biomedical Engineering, with faculty of the department based in the colleges of Medicine and Engineering, was formed in 2000. Startup of the department was funded by a $1 million grant from the Whittaker Foundation with ongoing support from the University (http://www.eng.uc.edu/dept_biomed/grad/bioinformatics/). The department will offer graduate degrees in bioinformatics. Research is a primary mission of the colleges of engineering and medicine and of the Children's Hospital Research Foundation, where the College of Medicine’s 300 faculty in pediatrics are based. Growth in research is a fundamental to the Medical Center's vision. Bioinformatics is an essential underpinning of this growth (http://www.med.research.uc.edu/core_fac/bioinformatics.cfm).

At the University of Cincinnati and Children's Hospital Research Foundation we have extensive and expensive core facilities for bioinformatics, with investments exceeding $10 million to date. As a matter of institutional strategy, the faculty and administration of the College of Medicine chose to locate the major bioinformatics core in the Division of Pediatric Informatics at the Children's Hospital Research Foundation (http://www.cincinnatichildrens.org/Research/Research_Cores/Pediatric_Informatics/default.htm). Initial funding for the bioinformatics core was provided by a Howard Hughes Research Infrastructure Improvement Grant. The Howard Hughes grant also provided funds for cores in proteomics (located in the College’s Medical Sciences Building) and genomics (located in the College’s Environmental Health Sciences Building). All three cores – bioinformatics, genomics and proteomics – are now functioning and serving all faculty of the Medical Center.
Recently the Division of Pediatric Informatics was awarded a $2.3 million grant to establish the nation’s first supercomputer research center dedicated to pediatric informatics research. There are presently five full-time faculty in Division, with additional recruitments underway. These faculty both conduct their own research and oversee support services for others. They have broad-based skills in bioinformatics, utilizing existing software and databases as well as developing new approaches to data acquisition and analysis.

While the highest concentration of hardware for computational biology is located at the Children’s Hospital Research Foundation, faculty with well funded research programs who utilize or develop tools of bioinformatics are located throughout the Medical Center. Two of the most developed programs are the NIH funded Center for Environmental Genetics (http://www.med.uc.edu/ceg/ceg.html) headed by Marshall Anderson, PhD, and the Center for Genome Information (http://genome.uc.edu/) headed by Ranajit Chakraborty, PhD. Both are located in the College of Medicine’s Department of Environmental Health. Two recent programs are the Genomics Research Institute (http://gri.uc.edu/) and the Department of Genome Science, both headed by David Millhorn, PhD. Both are new ventures and represent a major expansion of College research programs. They are located in a newly acquired research facility of approximately 500,000 square feet. Approximately 100 faculty will be located at the site when renovation is completed in December 2002. These faculty and programs heavily utilize resources in bioinformatics.

While the Medical Center has invested millions of dollars in resources, facilities, and faculty in genomics research and education, at least three critical needs remain:

- coordinate efforts in bioinformatics to develop institution-wide priorities;
- educate and train researchers and students in the use of the sophisticated computer applications required to carry out such research; and
- provide needed bioinformatics support services to UC researchers regardless of their location.

Integrating existing silos of expertise and resources is necessary to realize our full potential in genomic research and education. Development of a coordinated program in bioinformatics will be sought primarily from grants.

Research Administration Support

Over the last ten years the University of Cincinnati Medical Center has become a major research institution. With over $180 million in fiscal year 2001 in sponsored program awards, it now ranks in the top 25% of all public medical schools. This dramatic growth has been facilitated by the application of information technology in various units with responsibilities for research administration at the University of Cincinnati.

The activities of these units cover both the pre- and post-award phases of grant administration. Pre-award activities include funding opportunity information, grant and contract proposal development, fundraising, expertise databases, web sites, space planning, and sponsored research administration. Post-award activities include human
subject oversight (Institutional Review Board), animal use oversight (Institutional Animal Care and Use Committee), grant and contract administration, accounting, the commercialization of intellectual property, publication assistance, core facilities, institutional reports, and compliance (such as radiation safety and bio-safety). All activities are based in offices that are linked with the university’s financial system (CUFS) and human resources system (HRMS). We have developed several applications that support services in each phase of the Research Administration lifecycle.

Our need now is a tightly integrated research administration process that enables our researchers to be as productive as possible and our administrators to be as efficient and accurate as possible. We need systems that will reduce paper, reduce errors, and reduce the amount of time to prepare grant proposals, systems that match expertise with grant opportunities and with other investigators, and systems that ensure investigator compliance with state and federal regulations. Managing the flow and accuracy of information in the research administration process is an absolute necessity of the Medical Center is to meet its goal of doubling extramural research funding by 2006 as outlined in its Millennium Plan (discussed earlier in the plan). The Medical Center has committed funding to the development of the initial applications that will be part of a comprehensive, integrated system. Funding to boost and complete that development will be sought from grants.

**Facilitating Entrepreneurship**

The Medical Center has tremendous impact on the regional community (see Appendix 6 for the results of an economic impact study). Despite a rapidly growing University research base, there is a significant disparity between the discovery of new technologies and the commercialization of these technologies into products that can lead to enhanced economic status and improved quality of life throughout the region. A major factor identified as contributing to this situation is a fragmented and incomplete system for accessing the knowledge, skills and resources needed to assist entrepreneurs in succeeding in new venture creation. One part of the solution is to develop a system that targets nascent and early stage entrepreneurial ventures. Such a system would serve as a link and repository for local, regional, national and international resources, educational materials and expert advice. A Web-based approach would offer an effective solution for addressing the gaps that have been identified.

Such a system would include central repository for technology resources and educational materials and provide on-going networking opportunities and expert advice. As an enabling tool for entrepreneurial success, it would be scalable in its capacity to connect and archive program and resource information while being a “virtual learning laboratory” for on-campus and distant learners. Specific benefits would include:

- A blending of information acquisition with learning;
- Increased communication and collaboration between the University and the community;
• Cost effective way of reaching a larger pool of potential entrepreneurs and ability to include all interested individuals regardless of their locations and schedules;
• Ability to preserving live programs on video, for portability to specifically targeted groups in the future;
• The use of technology to expand the variety of learning formats and allow learners to achieve educational objectives in a logical progression, and in a manner consistent with their learning styles;
• Ability for students to access information that is relevant to their experiential needs at the time when it would be the most beneficial;
• Ability to evaluate, edit, and field test before being placed online, to ensure a high quality learning experiences;
• Ability to collect user feedback in order to develop a prototype for a formalized degree or certificate program based upon best practices.

The development of information management tools to support entrepreneurial activities will be supported through internal sources, federal grants, and private sector partners.

Curriculum Management

Continued and upgraded support of curricula is essential. The colleges will continue to develop tools for online evaluation of their curricula as well as online evaluation of student and faculty performance in the classroom and laboratory settings. Integration with tools such as the CurrMIT project through the Association of American Medical Colleges is essential. In addition to the current infrastructure, this will require expansion of our wireless network and the implementation of personal digital assistants by faculty and students. Use of curriculum materials through instructional technology tools such as Blackboard is growing. Such use will become more critical as our education sites grow. In addition to today’s clinical teaching sites, in the near future students will be located for extended periods of time at the Genomics Research Institute (10 miles northeast of the Medical Center) and University Pointe (15 miles north of the Medical Center). While network solutions will be in place to accommodate Internet-based videoconferencing and to provide full access to digital curriculum materials, the curriculum itself and pedagogical methods will need to be scrutinized and upgraded as necessary.

An expanded component of this is the utilization of computer-based testing. Such programs, which must be compatible with national examinations such as USMLE, are in nascent stages with plans for rapid expansion. The colleges will continue to support and develop curricula with funding for focused projects coming from grants.

Training

The Medical Center’s information management training program has grown from 12 offerings per month in 1996 to over 40 per month today (http://aitl.uc.edu/reference/edutrain.cfm). Once focused on teaching the use of bibliographic databases, it now encompasses office software, web development software, instructional technology software, and multimedia development. Class topics
include introductory, intermediate, and advanced levels of Microsoft Office XP applications (Access, Excel, FrontPage, Outlook, PowerPoint, Publisher, and Word), Adobe Acrobat, Adobe Photoshop, Blackboard, Digitizing Images, EndNote, Flash, Palm Pilot/ Pocket PC training, and Working with Digital Sound.

The Department of Internal Medicine offers a Clinical Informatics elective for fourth year medical students, most of which AIT&L staff coordinate and teach. This elective is an outgrowth of the previously funded IAIMS program at the Medical Center. The College of Nursing offers Nursing Informatics for Advanced Nursing Practice, which is co-taught by AIT&L. This two-credit course is taught every quarter as a required course for all graduate students in the College.

Since 1998, the University of Cincinnati’s Faculty Development Council has awarded funds to AIT&L and University Libraries to conduct special training seminars for faculty on the effective use of instructional technology in the classroom. Although over 1500 UC faculty have attended these training sessions, there is still a great need to continue to motivate, support, and train medical center faculty to make better use of technology in their teaching. Because of continuous advances in technology and the rapid evolution of instructional design principles, the needs constantly change. The Medical Center’s information management training program will continue to reinvent itself to meet the changing needs. The considerable resources required to support such a dynamic program will continue to be provided by AIT&L’s general operating funds, the College of Medicine, and University and extramural grants such as those offered by the Ohio Learning Network.

Electronic Resources

As documented in the Information Technology and Resources Self-Study, the Medical Center has followed an aggressive policy to convert collections from paper to electronic format whenever possible. As a result of AIT&L collection development efforts and collaborations with OhioLINK and University Libraries, over 3000 health-related full-text electronic journals and several hundred e-textbooks and databases are available to medical center faculty, staff, and students (http://aitl.uc.edu/reference/elec/Elecres.cfm). Despite this success, in the 2000 AIT&L Customer Services survey, we received several comments noting, “AIT&L has done a great job with securing online journals, but we need more!”

In addition, the marked increased in use of PDAs/handheld devices, especially by students, has increased the demand for subscription licenses for handbooks and other health reference tools available in PDA format. The Medical Center will continue to use a three-part strategy to fund electronic resources:

- OhioLINK provides over 4000 electronic full-text journals and 100 databases and other electronic reference tools to all academic libraries in Ohio, and is committed to increasing these collections;
• in partnership with University Libraries, we make additional resources available university-wide through a long standing cost-sharing arrangement under which AIT&L pays 12% of the cost to the University; and,
• AIT&L will continue to add electronic resources in addition to or instead of paper versions for titles not covered by the first two strategies.

Funding electronic resources will continue in this manner, with additional University support sought to increase the number of subscriptions to supplement OhioLINK.

Web Site Development

The Medical Center’s Web sites (http://medcenter.uc.edu), including those of all four colleges and AIT&L, now have a common “look and feel” as a result of close collaboration. The Medical Center IT Partnership, which began in 2000 as a voluntary collaboration among the four colleges and AIT&L to share servers, expanded its efforts in 2001 to include architecting Active Directory Services for the Medical Center, implementing a network security plan, expanding the applications of the Medical Center’s integrated database, and designing a common “look and feel” for the Web sites of the colleges and other Medical Center units. See Appendix 9 for more information about the IT Partnership.

While the common Web site design is a major step in promoting the Medical Center to an external audience, there is still a need to reconceptualize our Web presence by more carefully defining our public Web sites and developing customizable Web sites that provide context-sensitive, filtered information for individuals at the Medical Center. It is also necessary to expand the database underpinnings of the Medical Center’s Web architecture to take full advantage of the efficiencies the technology enables. The Medical Center will develop much of this capability through its continued commitment to information technology and information management, supplementing that commitment with grants such as IAIMS. Grants will be a source for addressing the expansion of the database architecture and personal profiling to enable various means to filter information for the individual.

Graduate Medical Education

The GME structure at our Medical Center is a partnership between the clinical departments of the College of Medicine and the University Hospital, a member of the hospital consortium, the Health Alliance of Greater Cincinnati. Increased coordination and integration across these two organizations is crucial to the educational success of our GME endeavor. This ranges from the use of electronic communication tools, such as email, to curriculum management and evaluation, to security and access issues between two distinct telecommunication networks. The Medical Center and the Health Alliance will continue to increase their collaborative efforts, funding the development of necessary systems as the needs are defined.
Network Expansion

The University’s new gigabit network is one of the best in the country. The installation of wireless capabilities throughout campus, however, has just begun, following successful large-scale tests at the College of Engineering, College of Medicine, and AIT&L’s Health Sciences Library from 1999 to 2002. The University’s plan to expand the wireless network to every geographic corner of campus will meet the connectivity needs of students and faculty who increasingly use mobile computing devices such as personal digital assistants.

The University, in partnership with colleges and departments, and with grants such as those available from the Ohio Board of Regents, is committed to expanding the wireless network. The vast amount of information available now on desktops in offices and at home needs to be available anywhere on campus via mobile computing devices, including University Hospital areas, where security and Health Insurance Portability and Accountability Act (HIPAA) issues must be addressed. The Medical Center is collaborating, through its office of general counsel, with the Health Alliance of Greater Cincinnati to address the impact of HIPAA on its education, research, and patient care activities.

Electronic Medical Record

UC Physicians and University Hospital have automated systems for various hospital and patient care functions. University Hospital is a beta site for LanVision’s accessANYware electronic medical record (EMR) application. Using a single login from any Web browser, a person can search and retrieve all patient health information. Through a single repository, the EMR provides means for recording both structured and unstructured data. accessANYware also includes a chart deficiency management system that allows administrators to analyze charts anytime from anywhere and enables clinicians to complete medical records, including electronic signatures, from anywhere. Document capture features also allow the hospital to capture and manipulate patient information from a variety of sources in relatively error-free fashion.

Physicians at the Medical Center have security clearance to use accessANYware from the Medical Center and any other location. Through the discussions that allowed this to happen, the need for clinicians to access Medical Center information resources from the Hospital became apparent. Security issues and HIPAA present challenges to be addressed to make this happen. University Hospital will continue to invest tens of millions of dollars into expanding and integrating its systems, including accessANYware. The Medical Center will continue to work with the Health Alliance of Greater Cincinnati and University Hospital to address security issues so that clinicians and students have full access to the Medical Center’s rich library, research, and education resources. We plan to fund a test of this in a new University Hospital outpatient facility adjacent to the Medical Center campus.
Hardware Replacement and Expansion

Upgrading hardware and software is and will continue to be a continuous need. A growing number of units of the Medical Center are committed to a three-year replacement schedule for desktop computers and servers. The expense has been built into annual operating budgets since 1997. Hardware in open Medical Center computer labs, where currently 300 desktop computers reside, is also replaced on a three-year schedule funded by the colleges and by the Ohio Board of Regents instructional technology program. Shared central servers, made cost efficient because of close collaboration among the Medical Center colleges and AIT&L (the IT Partnership), are upgraded and added as needed through a combination of college, AIT&L, and grant funds such as the Ohio Board of Regents technology initiatives grant program.

Consumer Information

The Medical Center is committed to serving the health information needs of the community. In 1994, our concern about the quality of health information on the Internet (pre-Web) and the strain of serving the community at large from a health sciences library whose mission is to serve the faculty, staff, and students of the Medical Center led us to reconceptualize how we provided consumer health information. We concluded that we would try to deliver information to the community primarily via the Web, which was still not in widespread use but which was clearly the medium of the future. We secured initial funding from the U.S. Department of Commerce, built a Web site called NetWellness, and delivered high-quality health information to the citizens of the tri-state region at home and at public computer sites (http://netwellness.org/). In 1997 NetWellness secured funding from the State of Ohio and expanded to include Case Western Reserve University and The Ohio State University. NetWellness’ key feature is “Ask an Expert.” About 200 faculty contribute their time and expertise to answer consumers’ questions in over 45 topics covering hundreds of diseases, conditions, and health and wellness topics. As of May 2002 these faculty have answered over 18,500 questions, creating a database of “real” consumer questions with responses by world-class health professionals. It has been and will continue to be funded by local, state, and federal grants. See Appendix 10 for more information about NetWellness.

The National Library of Medicine’s MEDLINEplus is an important consumer health resource we also promote to the community. As an NLM subcontractor, AIT&L contributes to the development of MEDLINEplus.

Continuing Professional Education

Continuing Professional Education has become an integral part of the credentialing and licensing process for most health professions. A combination of rapidly expanding scientific knowledge, tighter controls on professional practice, mandated training on specific topics are putting an increasing burden on all practitioners. The trend in continuing health profession education is toward a model of continuing professional development in which the practitioner engages in regular self-assessment and designs
educational experiences that meet his/her needs. This model is a shift away from health care professionals obtaining almost all of their continuing education by attending large, pre-designed lectures, seminars, and workshops. In the next five to ten years we will see more practitioners identify their educational needs from an analysis of their own practice data. They will develop their own educational goals and objectives and, in many cases, they will construct their own educational programs from easily available resources.

It is unlikely that the current requirements of documenting continuing educational experiences will disappear. The definition of continuing education, however, is likely to expand and there is likely to be a closer connection with demonstration of competence. We are already seeing hospital credentialing for physicians moving in the direction of a "portfolio" of cases and demonstration of competence with certain procedures. External pressures from insurers, managed care providers, and malpractice providers will create a need to stringently monitor practice behavior and to improve clinical practice. The increased pressure on clinical practice (doing more in less time) will create a need for practitioners to become efficient learners and to integrate their continuing education into their daily practice. Technologies that provide quick, easy access to a wide range of information resources in an organized manner will be essential tools for the health care provider in the near future. This need will be partially filled by the development of a clinical skills portfolio credentialing system that we hope to fund through IAIMS. Funding additional development will be through a combination of grants and college continuing education operations.

Our Information Problem

As the self-study demonstrates, we have made tremendous progress in information technology during the last ten years. The University has supported the development of centralized “utilities” such as a single high-speed network, email, help desk, institutional software and hardware licenses, information policies, and instructional technology software under the leadership of University of Cincinnati Information Technology (UCit). UC also enhanced its connection to the Internet by becoming an Internet2 charter member. These advances have enabled the Medical Center to pursue integrated database development, web development, training, and technology support services.

At the same time, Medical Center leadership engendered a culture of collaboration across departments, colleges, and institutions. Reed Gardner, Professor and Chair of Medical Informatics, University of Utah, recently said that “…medical informatics is 80% politics and sociology and 20% technology, though the numbers are sometimes more like 90% and 10%. The last few projects I have worked on the numbers may be 95% and 5%!!” If Dr. Gardner’s insights are true, the University of Cincinnati Medical Center is well-positioned to succeed at implementing an IAIMS operations grant. Its history of collaborative endeavors – OhioLINK, NetWellness, the Integrated Information Systems Committee, the Distributive Learning Collaboratory, and the IT Partnership – have paved the way to effectively address the politics, the sociology, and the technology of
an IAIMS operations grant program. See Appendices 8 and 9 for more information about the Distributive Learning Collaboratory and the IT Partnership.

Because our information technology infrastructure is sound and our culture thrives on collaborative programs, we were able to collectively identify the preeminent needs of the Medical Center. The common theme of most of those needs is information management, specifically managing the glut of information that is now available at the desktop. Most access issues have been addressed. People do not need more access (with the exception of more widespread wireless access). Rather, they need the overabundance of information filtered so that they see only relevant information organized in a way that is easy and intuitive to use. They need tools that help them manage information to make it relevant to the specific situation and that help them transform that information into useful, applicable knowledge. The next section of this plan describes our vision and goals of knowledge management. The section thereafter details our approach and strategies for achieving the vision and goals.
Knowledge Management

After the IAIMS task forces produced the self-study, the evaluation of needs, and a definition of our most important information problem – the overabundance of unstructured, unfiltered information – the IAIMS Steering Committee, with the involvement of key information technology and management specialists at the Medical Center, identified knowledge management as the key to the solution to that problem. The following discussion includes a vision, our ideas for potential technical solutions, and the goals that we intend to propose in an IAIMS operations grant proposal.

Vision

Our vision for knowledge management sees individuals having better and more secure access to information that is organized, filtered, and highly relevant for specific tasks in line with personal profiles. Smart tool sets and portals help individuals transform data and information into knowledge to support their role(s) within the Medical Center.

The Potential

Advances in information technology have catalyzed dramatic change that has caused us to rethink how we manage knowledge. Some of those advances are captured by the following principles:

- **Gordon Moore’s Microprocessor Law:** The power of the microprocessor performance doubles every 24 months.
- **Robert Metcalf’s Network Law:** The value of a network scales as $n^2$ where $n$ is the number of persons connected. That is, as the number of users doubles, the value of the network quadruples.
- **George Gilder’s Bandwidth Law:** The speed of optical and wireless networking technologies is doubling every sixteen months.

These advances will change the way applications are provided. Rather than providing traditional applications that are installed on servers and desktops, collections of digital services that perform specialized functions across the network will be developed. Rapid change also demands new skill sets requiring people to learn to use new technology to transform data and information into knowledge.

Infrastructure

Advances in information technology have created an “information utility.” This information utility is the integration of wireless and wire-based networks into one multiple-purpose network for communications, data, computing, and multimedia. The mobile wireless Internet communication technology components of the infrastructure will increasingly provide greater flexibility in how, where, and when organized information
can be accessed. This infrastructure allows for a more organized distribution of information.

**Rethinking**

We are living in a period of unprecedented, disruptive, and transformative change where knowledge is expanding rapidly. Because of the advances in information technology, the Internet is becoming more versatile and more valuable than ever. These advances have resulted in an excess of data and information that needs to be quality filtered and distributed to people in a more specific task relevant and timely manner. Technology is needed to acquire, produce, store, distribute, integrate and manage this information. This requires a holistic approach that requires that we:

- Rethink how we can **accommodate rapid change** organizationally;
- Rethink how we create systems to share information resources across organizations;
- Rethink how we design systems to acquire, store, access, disseminate, integrate and manage an over abundance of information.

**Accommodate Rapid Change**

“A company’s fundamental strength is its ability to adapt to change, rather than predict it.” -- Jack Welch

“There is no stable formula for success” -- Tom Peters

The greatest resource to organizations is the knowledge that resides in the people and collectively in the organizations. Individuals are required to take initiative, adapt, and accommodate rapid change. Learning accelerators, ways of absorbing change (for example, intensive training sessions), must be built into modern organizational strategies. Each person must be empowered by encouraging him/her to take part in change and help to guide it. Information transfer and filtering systems must be developed to achieve that goal.

**Create Systems to Share Information**

**Smart Digital Services**

We cannot develop and design systems in a conventional manner. We must rethink how we develop and design systems. As we look forward five to ten years, it is clear that we will evolve from "systems" to "smart digital services." Smart digital services are shared functionality (“components”) that span multiple applications and are defined not by boundaries of a given system but by the "customer's common profile" which defines a person’s knowledge needs. The objective is to develop sharable smart digital services that provide specific knowledge to an infinite number of individuals through personalized portals.
In current parlance, systems are vertically integrated processes (“silos”) that combine a clustering of related tasks. In their best current embodiment, systems consist of thin clients accessing integrated relational databases via a middleware component. This means that we can create views of information that enable customers to utilize smart digital services to meet their specific needs. Smart digital services integrate and blend these silo systems into dynamic portals that provide specific knowledge based on the personal preferences of customers (customer profiles tied to login and authentication).

In summary, smart digital services will be developed so that they can be shared and reused across applications using standard protocols, coding, and open interfaces. By developing shared reusable components we can better use our information technology talent and resources as we develop these smart digital service once rather than many times. Systems will be developed by assembling these pre-built smart digital services rather than building them from scratch. This will allow us to achieve higher degrees of flexibility and accommodate rapid change. We will address security issues in the development of smart digital services, particularly the implications of the Health Information Portability and Accountability Act (HIPAA) of 1996.

Personal Profile Data

Each person will have a personal profile, listing his/her needs and levels of expertise. The personal profile will be updated manually, by the person, and automatically from existing systems. The role of the personal profile is to determine the types of information that are to be quality filtered for each person. For example, the personal profile data is used to push to each person context-appropriate information – the information relevant to their specific tasks, positions, and needs, organized and presented for effective use – in a timely fashion, without overloading them with irrelevant information.

Individuals will be able to modify their private portals to add topics of interest and suppress information that their profiles selected but they do not want to see. They will also be able to specify what personal or professional information they want made available generally or just to selected groups within the university.

For people at the Medical Center, their interests and needs will depend on their jobs, the roles they play at the university, and the positions they hold. Our integrated
database contains the “jobs” and “roles” data; individuals can use a self-identification questionnaire to specify their “positions” data. Based on this information, the database will automatically maintain a personal profile for each person. When people log onto the Medical Center web site and connect to their private portal, they will see links to their context-appropriate information. This information is pushed to them, based on their profiles. They may also be alerted to important upcoming events, such as a professional training certification that will expire soon, or a seminar of interest in their primary research area.

It is important that profile data be standards-based. We will conform to the emerging Eduperson and Meduperson personal data standards. We will employ the vocabulary standards, MeSH and UMLS, whenever possible.

Private Portal

The private portal is a browser display created by middleware and personalized to accommodate an individual’s needs. It represents the individual’s view of organized information. The private portal, utilizing the personal profile, is able to access organized information from any network-connected device, any browser, anywhere, anytime and any place. Wireless access and mobile devices allow for flexibility by providing location independence. The private portal, enabled by intelligent smart digital services, can access an integrated relational database over the network. The private portal is an effective mechanism to counterbalance information overload by allowing for more precise access (pull, share) and distribution (push, alert) of information.

Manage an Over Abundance of Information

Data and information alone are insufficient to achieve high levels of effectiveness. Knowledge is necessary. Knowledge is the integration and application of data and information combined with insight and understanding gained from experience. Context is an important differentiator of knowledge and information. The unifying approach of knowledge management is to design digital services to acquire, produce, store, distribute and integrate information in a way that an individual can transform it into knowledge.

Information Integration

Information will be integrated by organizing it into self-describing structures that can be accessed semantically (by matching profiles) and by applying smart digital services. Information will be organized in a location independent manner accessible by any type of browser-enabled device using both wired and wireless technology. Smart digital services will be built using business rules, profiles, sophisticated middleware, and an integrated relational database. Four examples of smart digital services that distribute information are the following:

- **Consultant** (push)
- **Requestor** (pull)
- **Alerter** (alert)
- **Expert** (share)
Consultant (Push)

The Consultant will push or deliver specific personalized information to a person based on his/her preferences, wants and needs. The Consultant will assist people in sorting through the masses of data and information automatically.

Examples of the types of information that might be pushed to a person’s portal include:

- Grades
- Required training courses
- Funding opportunities
- Specific research tools
- Research progress report forms
- New research results
- Experienced users/consultants of specific software.

Requestor (Pull)

The individual can pull or query the Requestor smart digital service for ad hoc information. The Requestor will guide the customer to retrieve the most relevant and authoritative information.

Examples of the types of information that might be pulled by a person include:

- Remedial education resources
- Specific funding opportunities
- Compliance report for departmental personnel
- Concise reports that allow a researcher to quickly draw conclusions about data
- Data mining by examining large volumes of biological data uncover pattern
- Ad hoc search to locate specific bioinformatics tool that solves a specific problem

Alerter (Alert)

Sometimes a person needs to be quickly informed of critical events. This type of information needs to be sent to a person immediately based on his/her role and the context. These event messages would typically be sent proactively to e-mail, pagers and cell phones.

Examples of the types of information about which the Alerter might notify a person include:

- Student’s performance deficiency
- Over due IRB/IACUC progress report
- Over due grant progress report
- Missed compliance training
- New research tool.
Expert (Share)

The Expert is a way of collaborating among people who have specific information needed by others and are willing to share. This requires that we pre-identify people who have similar interests and are willing to respond to specific questions. A person would have “key words” in his/her profile about areas of expertise. A question about a specific topic would be submitted to a collaboration tool, the Expert, and then dispatched to a person who is likely to have the skills to have an answer. The answer would be returned to the originator and added to the knowledge-base for use by others.

Examples of when a person might use the Expert include:

- A student studying needs to know …
- A researcher wants to ask another researcher in the same field about …
- A researcher wants to ask another researcher about the best analytical software to solve a class of problems

Goals

Guided by our vision for knowledge management and our understanding of the Medical Center’s present and future needs discussed in the “Information Needs” section of this plan, the IAIMS Steering Committee identified three goals for an IAIMS operations grant. These goals meet needs that are among the most crucial for the Medical Center to continue to fulfill its mission. The Steering Committee concluded that fulfilling these goals would bring the greatest benefit at a cost that could be afforded through a combination of grants and institutional resources. These goals also can be achieved, we believe, by applying our knowledge management model and addressing the IAIMS activity areas of context-appropriate information, standards-based information management, and digital libraries.

Goals for our IAIMS proposal will be to:

1. Improve teaching effectiveness by improving the assessment of health professional students and residents in laboratory and clinical teaching/learning environments.
2. Improve the ability of researchers, educators, and students to acquire and apply the knowledge required to be more productive in genomic research and education.
3. Increase the productivity of researchers and administrators in the pre-award, post-award, and compliance phases of the research lifecycle.

These goals are amenable to measurable outcomes, which will be developed for our IAIMS operations grant proposal.
Plan for IAIMS Implementation

The IAIMS Implementation Plan Task Force developed the following plan approved by the IAIMS Steering Committee.

Approach

The Medical Center, within its strategic framework, operates predominantly on a project basis. We plan, experiment, prototype, test, and distribute successfully tested prototypes. We will use the same project approach to implementing IAIMS. Based on the specific goals – identified in the previous section of this plan – that we intend to achieve through IAIMS, we will define three projects in our IAIMS operations grant proposal. We will develop the projects around the knowledge management model, refined and expanded, described in the previous section.

The projects we will define in our proposal, in addition to addressing institutional long-term objectives, are consonant with our practical talents and tools. They will be integrated at the database, middleware, and customer view levels. The projects we will propose are:

1. A flexible, digital multimedia record documenting that students and residents have acquired the clinical skills required for awarding of their degree or for credentialing by accrediting and licensing agencies.
2. A coordinated bioinformatics program with a focus on digital learning tools. These tools will provide an efficient, systematic education to faculty and students in the accession, analysis, and manipulation of biological information by computational methods.
3. An efficient, effective, and comprehensive digital research administration service, converting stand alone systems and isolated processes into integrated digital services throughout the University.

These projects will bridge the traditional “silos” of education, research, patient care, and administration, and fill major gaps in the Medical Center’s ability to achieve its mission and strategic vision more effectively. Faculty and students will have more time to devote to educating, learning, researching, and practicing, and will spend less time and effort navigating the bureaucracy, sifting through irrelevant information, and correcting data and processes that could have been accurate and valid initially. The cost savings in increased productivity alone we project will equal our investment in a very short time. The increase we anticipate in successful grant submissions by researchers will compound the benefits of these projects. Improved clinical skills among students and residents will directly affect their performance on board and accreditation exams and ultimately the quality of care they provide. This in turn improves the image and reputation or our Medical Center, an incalculable benefit on many levels.
Specifically, benefits of each project include:

- The portfolio-based credentialing project will provide the rich communication and documentation needed for optimal clinical skills training. A student, resident, and instructor will have available a complete multimedia record of the student’s or resident’s clinical performance, with real-time feedback and remediation.
- The bioinformatics project will coordinate the many bioinformatics initiatives at the Medical Center, establish a unifying vision, and reduce duplication. It will provide to students, educators, and researchers focused information management support and training for genomics and proteomics research. The Medical Center has invested heavily in genomics research as a strategic focus and aspires to be a national leader. Developing the proposed bioinformatics program is crucial to that success.
- The research administration project will enable researchers to improve their productivity. They will develop grant proposals more efficiently and effectively, with compliance requirements built into the process. Administrators will have access to all current, context-appropriate data and information to facilitate the Medical Center’s overall research enterprise. To fulfill the Medical Center’s Millennium Plan for doubling its extramural research funding in five years, this project is essential.

Organization Issues

Our IAIMS planning efforts concluded in March 2002 with the following management plan for implementing an IAIMS operations grant:

**Principal Investigator**

The Dean of the College of Medicine, John J. Hutton, MD, who will return to the faculty full-time in bioinformatics on July 1, 2002, will be the principal investigator/program director. Dr. Hutton is in a unique position of having the deep institutional knowledge that 15 years of serving as Dean have provided and of returning to research in bioinformatics, an area crucial to the Medical Center’s success and integral to our IAIMS plan. For many years he was an NIH-funded investigator and is well-published in molecular biology.

**Co-Investigators**

William K. Fant, PharmD, Assistant Dean for Clinical and External Affairs, Associate Professor, College of Pharmacy, has led the development of information technology and management in the College of Pharmacy – and, through the collaborations he has helped to catalyze, the Medical Center at large – for many years. He is a founding member of the Medical Center IT Partnership and Distributive Learning Collaboratory.

J. Roger Guard, MLS, Assistant Senior Vice President, Medical Center Academic Information Technology and Libraries, and CIO, College of Medicine, brings the philosophy of open and collaborative development of integrated systems. He has led large, multi-institutional collaborations like NetWellness. His background in technology and libraries is a critical component of the IAIMS management team.
Gregory W. Rouan, MD, Professor and Associate Chair for Medical Education, Department of Internal Medicine, College of Medicine, and President, Alliance Physicians and Surgeons, has been involved in many clinical technology initiatives, including the Medical Center’s IAIMS initiative in the 1980s and the Alliance’s implementation of an electronic medical record.

Evaluation Coordinator

John R. Kues, PhD, Assistant Dean for Continuing Medical Education, College of Medicine, will be the IAIMS evaluation coordinator. With the Management and Evaluation Team, he will develop and implement an evaluation plan based on measurable results. He will establish continuous communication loops with the principle investigator, the co-investigators, and the project teams. Dr. Kues, an active grantsman, has developed many evaluation plans and conducted numerous evaluation processes.

Project Teams

Teams will be formed to implement each of the three projects. The project team leaders/co-leaders will appoint team members, with Steering Committee approval, who have either content or technical expertise relevant to the projects. Team members will include faculty, students, staff, and administrators, as appropriate, and database developers, web developers, and librarians. Team leaders will be:

- **Portfolio-Based Credentialing for Health Professions Education**, William K. Fant, PharmD, John R. Kues, PhD, Gregory W. Rouan, MD, Co-Leaders.
- **Bioinformatics, Interdisciplinary Research and Education**, Bruce Aronow, PhD, John J. Hutton, MD, Michael A. Lieberman, PhD, Co-Leaders.

Project Oversight Committees

An oversight committee for each project will be charged to continuously evaluate the project’s direction and vision and oversee progress. Committee members will be Medical Center leaders who are aware of national and international trends in their fields and who will provide broad, long-term perspectives. It will be important for project teams to continually adjust to external factors. Dr. Fant, Dr. Hutton, and Mr. Guard will chair the oversight committees for the projects whose teams they co-lead.

IAIMS Steering Committee

The existing IAIMS Steering Committee will continue in an oversight capacity. The Senior Vice President and Provost for Health Affairs will continue to serve as its chair. The committee will be charged to provide direction and continuous consultation to the Management and Evaluation Team. Additional knowledgeable people will be invited to
join the Steering Committee as needs arrive. The committee will evolve as the needs of the program change. Its purpose and membership will be evaluated periodically.

Management and Evaluation Team

The Management and Evaluation Team will consist of the principal investigator, the co-investigators, the evaluation coordinator, and the co-leaders of the project teams. The management team will meet regularly to assess progress, share experiences, and integrate the results of continuous evaluation. The principal investigator will lead the team.
After our most of our IAIMS planning effort concluded in March 2002, project teams consisting of content and technology experts began planning the development of the three selected initiatives that will be our specific aims in an IAIMS operations proposal. Each team used a similar process to construct specific schedules. The process included:

1. The project specifications (customer requirements) were prepared using case scenarios.
2. A work breakdown structure was prepared organizing tasks (work to be done) and events (results) into major units of work based on the specifications.
3. Resource needs were defined. A responsible person was assigned to each task.
4. Effort estimates (how many staff days for each task) were prepared based on the use case scenarios from the work break down structures.
5. Schedules were prepared sequencing tasks based on predecessor and successor relationships.
6. Budgets were prepared based on the schedules.

From those specific project schedules the following summary timetable was derived.
<table>
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<th>Task Name</th>
<th>Duration in days</th>
<th>03</th>
<th>04</th>
<th>05</th>
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<td>Computational Infrastructure in Bioinformatics</td>
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Resources Required

We calculate that the proposed projects and evaluation can be accomplished over four years with 9+ full-time equivalent (FTE) staff. The necessary staff include:

<table>
<thead>
<tr>
<th>Type</th>
<th>FTE</th>
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<tr>
<td>Faculty/Content Experts</td>
<td>2.12</td>
</tr>
<tr>
<td>Technical Specialists</td>
<td>6.72</td>
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<tr>
<td>Administrators</td>
<td>.30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>9.14</strong></td>
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</table>

*Faculty/Content Experts*
Each project requires the participation of faculty and other content experts. This expertise includes knowledge of clinical skills instruction, bioinformatics, the research process, training, and evaluation.

*Technical Specialists*
Technical staff required will include database and middleware programmers, web designers, analysts and testing specialists, instructional designers, digital multimedia specialists, and network and server engineers.

*Administrators*
Because of our existing talent pool of faculty and technical staff, our successful project experience, and our culture of collaboration, we will need minimal program administration. Administrators’ time will be devoted to leading oversight committees, communication among IAIMS staff and with the Medical Center at large, and setting direction and adjusting the vision to accommodate external factors and technology advances.

IAIMS personnel will be drawn entirely from existing employees. The most dedicated and talented people will be offered the opportunity to work on our IAIMS program. With funds offset by IAIMS, we will hire some replacement staff to perform existing operations. An IAIMS operations grant will give us an opportunity that might otherwise not exist to re-engineer our information technology operations.

A $400,000 a year operations grant will fund the salaries and benefits of about 4 FTE, with a modest amount remaining for consultants and symposia. The Medical Center will contribute over five full-time equivalent staff to ensure that the projects are completed on schedule. The Medical Center will also contribute all the necessary hardware and software, supplies, travel, professional development, and indirect overhead costs.
Attachment
Organizing for IAIMS Planning

IAIMS Steering Committee

Charge:
To conduct a critical study of the present state of information technology, resources, and policies at the Medical Center; to assess the information technology and information management needs of Medical Center faculty, students, and staff; to define information problems and develop a vision and an action plan based on the analysis of gaps between our present state and our desired future state; and, to develop an IAIMS plan, in preparation for an IAIMS operations grant proposal, for the University of Cincinnati Medical Center.

Members:
Donald C. Harrison, MD, Senior Vice President and Provost for Health Affairs (Chair)
Daniel E. Albrinck, JD, CPA, Associate Senior Vice President, Medical Center, Associate Dean, Management & Finance, College of Medicine
Marshall W. Anderson, PhD, Professor and Chair, Department of Environmental Health, College of Medicine
Ralph F. Brueggemann, MBA, Director, Systems Development and Maintenance, Medical Center Academic Information Technology and Libraries
Mark H. Eckman, MD, Chair, Division of General Internal Medicine, College of Medicine, and Director, Center for Clinical Effectiveness, Institute for Health Policy and Health Services Research
Lou Ann T. Emerson, DNS, RN, Associate Dean and Associate Professor, College of Nursing
William K. Fant, PharmD, Assistant Dean for Clinical and External Affairs, Associate Professor, College of Pharmacy
Andrew T. Filak, Jr., MD, Associate Dean for Medical Education and Professor of Family Medicine, College of Medicine, Associate Chief of Staff for Graduate Medical Education, University Hospital
J. Roger Guard, MLS, Assistant Senior Vice President, Medical Center Academic Information Technology and Libraries, and CIO, College of Medicine
Gilbert R. Hageman, PhD, Professor of Rehabilitation Sciences and Associate Dean, College of Allied Health Sciences
Robert F. Highsmith, PhD, Associate Dean & Director, Office of Research and Graduate Education, and Professor of Molecular Physiology, College of Medicine
John J. Hutton, MD, Christian R. Holmes Professor and Dean, College of Medicine, Professor of Pediatrics
John R. Kues, PhD, Assistant Dean for Continuing Medical Education, Professor of Family Medicine, College of Medicine
Michael A. Lieberman, PhD, Distinguished Teaching Professor of Molecular Genetics, College of Medicine
Stephen A. Marine, MLS, Director, Outreach, Medical Center Academic Information Technology and Libraries
Prabha Nagarajaraao, Student, College of Allied Health Sciences
Gregory W. Rouan, MD, Professor and Associate Chair for Medical Education, Department of Internal Medicine, College of Medicine, and President, Alliance Physicians and Surgeons
Leslie C. Schick, MSLS, Director, Library Services, Medical Center Academic Information Technology and Libraries
Frederick H. Siff, PhD, Vice President for Information Technology and CIO, University of Cincinnati
Alfred J. Tuchfarber, PhD, Director, Institute for Health Policy and Health Services Research, and the Institute for Policy Research
Information Technology and Resources Self-Study Task Force

**Charge:**
To assess existing information technology and information management resources to capitalize on strengths and address weaknesses.

**Members:**
Leslie C. Schick, MSLS, Director, Library Services, Medical Center Academic Information Technology and Libraries (Co-Chair)
Ralph F. Brueggemann, MBA, Director, Systems Development and Maintenance, Medical Center Academic Information Technology and Libraries (Co-Chair)
Andrew T. Filak, Jr., MD, Associate Dean for Medical Education and Professor of Family Medicine, College of Medicine, Associate Chief of Staff for Graduate Medical Education, University Hospital, and Chair, Academic Information Technology Advisory Committee
Gregory A. Fish, MS, Technology Manager, Data Center, Servers, and Security, Medical Center Academic Information Technology and Libraries
Wade Hedgren, Senior Research Associate, Cell Biology, Neurobiology, and Anatomy, College of Medicine
Neil Holsing, Research Associate, Internal Medicine, College of Medicine
James Krabacher, Research Associate, Environmental Health, College of Medicine
Richard Muskopf, Information Systems Manager, Surgery, College of Medicine
Josette Riep, Technology Manager, Web Development, Medical Center Academic Information Technology and Libraries
Andrew Saunders, Informatics Director, Pathology and Laboratory Medicine, College of Medicine
Kenneth Wigle, Director, Information Systems, Family Medicine, College of Medicine

**Participating Committees, Organizations, and Programs:**
Medical Center Integrated Information Steering Committee
Medical Center Libraries Advisory Committee
Medical Center Academic Information Technology Advisory Committee
Medical Center IT and Network Managers
Medical Center Information Technology (IT) Partnership
Medical Center Distributive Learning Collaboratory
College of Allied Health Sciences Ad Hoc Technology Advisory Committee
College of Pharmacy Information Technology and Resources Committee
College of Nursing Center for Academic Technologies and Educational Resources (CATER) User Group
College of Medicine IT in the Curriculum Committee
Medical Center PDA Users group
Medical Center Firewall, Server and Desktop Task Force

Information Needs Task Force

**Charge:**
To determine the information management needs of university health care providers, educators, researchers, students, and administrators.

**Members:**
Alfred J. Tuchfarber, PhD, Director, Institute for Health Policy and Health Services Research, and the Institute for Policy Research (Chair)
Mark H. Eckman, MD, Chair, Division of General Internal Medicine, College of Medicine, and Director, Center for Clinical Effectiveness, Institute for Health Policy and Health Services Research
Lou Ann T. Emerson, DNS, RN, Associate Dean and Associate Professor, College of Nursing
J. Roger Guard, MLS, Assistant Senior Vice President, Medical Center Academic Information Technology and Libraries, and CIO, College of Medicine
Gilbert R. Hageman, PhD, Professor of Rehabilitation Sciences and Associate Dean, College of Allied Health Sciences
Robert F. Highsmith, PhD, Associate Dean & Director, Office of Research and Graduate Education, and Professor of Molecular Physiology, College of Medicine
John R. Kues, PhD, Assistant Dean for Continuing Medical Education, Professor of Family Medicine, College of Medicine
Stephen A. Marine, MLS, Director, Outreach, Medical Center Academic Information Technology and Libraries
Gregory Rouan, MD, Professor and Associate Chair for Medical Education, Department of Internal Medicine, College of Medicine, and President, Alliance Physicians and Surgeons
Prabha Nagarajarao, Student, College of Allied Health Sciences

Participating Committees, Organizations, and Programs:
IAIMS Steering Committee
Medical Center Integrated Information Steering Committee
Medical Center Libraries Advisory Committee
Medical Center Academic Information Technology Advisory Committee
Medical Center Information Technology (IT) Partnership
Medical Center Distributive Learning Collaboratory
Medical Center IT and Network Managers
College of Allied Health Sciences Ad Hoc Technology Advisory Committee
College of Pharmacy Information Technology and Resources Committee
College of Nursing Center for Academic Technologies and Educational Resources (CATER) User Group
College of Medicine IT in the Curriculum Committee
College of Medicine Education Coordinating Committee
College of Medicine Curriculum Committees:
  Year 1 Curriculum Committee
  Year 2 Curriculum Committee
  Clinical Biennium Curriculum Committee
  AHEC Subcommittee of the Clinical Biennium Curriculum Committee
  Neuroscience Curriculum Subcommittee of ECC
College of Allied Health Sciences Academic Policies Committee
College of Nursing Curriculum Committee
College of Pharmacy Curriculum and Outcomes Assessment Committee
College of Medicine Committee on Research
College of Allied Health Sciences Research Task Force
College of Nursing Intramural Research Review Committee
College of Pharmacy Research and Scholarship Committee
Medical Center Entrepreneurial Advisory Committee
Medical Center PDA Users group
Medical Student Association
College of Allied Health Sciences Student Tribunal
College of Nursing Student Tribunal
College of Nursing Student Nurses Association
College of Pharmacy Student Tribunal
Medical Center Firewall, Server and Desktop Task Force
Internal Medicine House Staff (Residents)
  Year 1
  Year 2
  Year 3
  MedPeds Residents
Implementation Plan Task Force

Charge:
To develop an implementation plan, timetable, and projection of required resources for the implementation of IAIMS.

Members:
John J. Hutton, MD, Christian R. Holmes Professor and Dean, College of Medicine, Professor of Pediatrics (Chair)
Daniel E. Albrinck, JD, CPA, Associate Senior Vice President, Medical Center, Associate Dean, Management & Finance, College of Medicine
Lou Ann T. Emerson, DNS, RN, Associate Dean and Associate Professor, College of Nursing
William K. Fant, PharmD, Assistant Dean for Clinical and External Affairs, Associate Professor, College of Pharmacy
J. Roger Guard, MLS, Assistant Senior Vice President, Medical Center Academic Information Technology and Libraries, and CIO, College of Medicine
Gilbert R. Hageman, PhD, Professor of Rehabilitation Sciences and Associate Dean, College of Allied Health Sciences
Stephen A. Marine, MLS, Director, Outreach, Medical Center Academic Information Technology and Libraries
Gregory W. Rouan, MD, Professor and Associate Chair for Medical Education, Department of Internal Medicine, College of Medicine, and President, Alliance Physicians and Surgeons
Leslie C. Schick, MSLS, Director, Library Services, Medical Center Academic Information Technology and Libraries
Alfred J. Tuchfarber, PhD, Director, Institute for Health Policy and Health Services Research, and the Institute for Policy Research

Participating Committees, Organizations, and Programs:
IAIMS Steering Committee
Medical Center Integrated Information Steering Committee
Medical Center Business Administrators