Creating the future: IAIMS planning premises at the University of Washington*

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In September 1990, the University of Washington (UW) received a Phase I IAIMS Planning Grant from the National Library of Medicine and embarked upon a planning process involving the entire health sciences center. As a result of our relatively late entry into IAIMS planning, we have been able to learn from the experiences of other health sciences centers and to leverage our existing institutional efforts. Consequently, our progress has been rapid, and in a little over a year, we drafted a long-range plan and embarked on several related research and development projects. The hallmarks of our planning process include careful study of both the UW institutional environment and the experiences of other IAIMS institutions throughout the United States; broad, interdisciplinary participation of faculty, librarians, and administrators; an intensive educational process; a focus on people rather than technology; and, above all, leveraging of existing institutional and research projects that support our vision for the future.

INTRODUCTION

Information technology is reshaping rapidly the practice of medicine, the conduct of research, and the delivery of instruction in the academic health sciences center. As a result of the seminal Matheson Report, information now is recognized as a strategic necessity in the pursuit of excellence, and technology is seen as the key to accessing and exploiting information [1]. A recent report by the Association of Academic Health Centers (AAHC) Study Group on Information Sciences focuses on the many problems of managing information in an academic health center and the promise of integrated information management systems [2]. The report concluded that "efficient, rapid access to information is essential to progress in administration, patient care, education, and research . . . in our nation's academic health centers." Recognizing the importance of integrating and managing information, the University of Washington Health Sciences Center (UWHSC) has committed itself to the Integrated Academic Information Management System (IAIMS) concept to enhance its leadership in academic, research, and clinical missions.

IAIMS planning began at UWHSC with funding from the National Library of Medicine (NLM) in September 1990. This funding was the catalyst for a successful planning process and the creation of a long-range plan. Our overall goal is to create a comprehensive and transparent information access and management network that will complement and, indeed, amplify the technological and organizational diversity of UWHSC and its affiliated institutions and programs. This means providing students, educators, clinicians, administrators, librarians, researchers, and staff with convenient and timely access to the information they need for optimal function, regardless of the physical location of the user, the resource or system involved, or the format of the information.

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THE ENVIRONMENT

We began our planning process with a study of the institution's environment and characteristics. Some of the unique features of UW helped shape our planning. As a public institution, the university's mission is to provide residents of the state and the Northwest with outstanding programs in education, research, and public service. UW regularly ranks among the top five universities nationally in federal grant and contract awards and is number one among state universities—a status that reflects the excellence of the faculty and the diversity of research programs.

UWHSC includes schools of dentistry, medicine, nursing, pharmacy, public health and community medicine, and social work, as well as two hospitals, the University Medical Center and Harborview Medical Center. The environment is characterized by decentralization and a heavy focus on research. While each of the UWHSC units is semiautonomous, all units contribute to the strength and purpose of the whole. Many programs involve extensive interdepartmental and interdisciplinary collaboration within the health sciences, with the main campus, and with other regional, national, and international institutions. In such an expansive environment, it has been relatively easy to convince key individuals of the value of integrated information systems and the need for faculty and administrative access to networked workstations. But at the same time, such decentralization also poses challenges in the development of shared databases composed of common data elements and definitions.

Regional cooperation and commitment to meeting the health care needs of the rural Northwest are other hallmarks of all UWHSC schools and programs. Last year marked the twentieth anniversary of the UW School of Medicine's WAMI program, which is responsible for medical education in Washington, Alaska, Montana, and Idaho. Instruction and training occur at sixty-one sites throughout the region. UWHSC serves as a primary source for continuing education for health professionals throughout the Northwest. The Health Sciences Library and Information Center (HSLIC), with its extensive holdings and a large and diverse staff, not only serves UWHSC but also is the regional medical library for the Pacific Northwest, serving Washington, Oregon, Alaska, Montana, and Idaho. Clearly, the university's regional responsibilities and partnerships, as well as its comprehensive research programs, offer a number of opportunities and challenges in integrating diverse information systems to serve such a dispersed clientele.

COMPUTING RESOURCES

The university is blessed with a very rich and technologically sophisticated computing environment. A guiding philosophy is the concept of uniform access to computing; that is, faculty, staff, and students are entitled to computing accounts offering basic access to computing resources in support of research and instruction needs at no cost to themselves or their departments. Similar computing and networking standards have been adopted by the two medical centers. While systems heterogeneity always will exist at UW, common strategies underlie system linkages and communications. UW is a member of NorthWestNet, one of eight regional computing networks in the United States. NorthWestNet serves institutions of higher education, government agencies, not-for-profit organizations, and industry in six states (Alaska, Idaho, Montana, North Dakota, Oregon, and Washington). NorthWestNet will play a significant role in supporting the regional IAIMS vision by linking health care organizations and health professionals throughout the Pacific Northwest.

THE HEALTH SCIENCES LIBRARY AND INFORMATION CENTER (HSLIC)

Throughout UWHSC, the library is considered very important in information management, and librarians are expected to provide leadership in coordinating and facilitating information flow in support of education, research, and patient management. The library's central role in the IAIMS planning effort was underscored by the vice-president for health sciences's choice of the HSLIC director as the IAIMS coprincipal investigator. HSLIC librarians have held active and prominent roles throughout the IAIMS planning process. The IAIMS project manager is a librarian and former staff member of the National Network of Libraries of Medicine, Pacific Northwest.

The rationale for this broad participation by librarians in IAIMS planning is the belief that the knowledge and skills of health sciences librarians are valuable in all aspects of information management. Librarians possess information management and retrieval skills that are transferable beyond bibliographic databases to clinical and research databases. Their insights into thesaurus construction, indexing, database design, hardware, and software specifications ensure that their input is useful and relevant. Above all, librarians understand how health professionals use information. Librarians can serve as advocates and reality checks during systems design, making programmers aware of the practical problems faced by the users. A related benefit of UWHSC librarians' participation in IAIMS planning is that we now know a lot more about the business of our academic health sciences center and, as a result, can create more useful library information services and educational programs.

Anderson and Fuller, who explored the manage-

ment and organizational issues resulting from librarian's participation in integrated institutional information programs, noted that, by virtue of their place in a neutral agency, librarians can lead an IAIMS planning process [3]. Indeed, as recently observed by Walt Panko, assistant dean for information technology at the University of Michigan Medical Center, libraries are the "Switzerland" of the academic health sciences center. This is certainly the case at UW.

LESSONS FROM OTHER IAIMS INSTITUTIONS

As we studied the experiences of the other IAIMS institutions, one of the most obvious findings was the enormous diversity of approaches. In some health sciences centers, IAIMS was truly a centerwide effort; in others, a particular school (usually medicine) drove the effort. Because many of the early IAIMS sites were autonomous, the broader university community (outside the health sciences) tended not to be involved in planning. In a number of institutions, a single individual was responsible for leading the process, while in others it was a shared responsibility. In some cases, the library was an integral part of the process; in others, it was more tangential. In summary, contrary to the early assumption that three or four planning models or approaches would develop from which new IAIMS participants might choose, there seemed to be no common approaches. Like the institutions in which they are carried out, IAIMS efforts are characterized by their uniqueness—in fact, that may be the only characteristic they have in common!

Another observation was that, while many IAIMS planning efforts set out to be user-centered, as time went on, the processes became more and more technology-driven. Critical decisions had to be made regarding networking and communications protocols and other computing and systems standards. The best of intentions regarding users' needs can be overwhelmed easily when planning the wiring of an asbestos-laden building. Users may be wired based on who is most accessible and least costly to reach, not on who most needs (or wants) a connection. A related issue was centralized versus decentralized computing. The "mainframe mentality," envisioning a single integrated system on a single (usually proprietary) host, was running headlong into growing numbers of personal computer users who savored their independence and wanted to avoid, at all costs, their previous dependence on centralized computers. The distributed computing model, which is given today, was frequently debated during the early IAIMS days. Some individuals viewed IAIMS planning as an attempt by computing centrists to take away their computing autonomy.

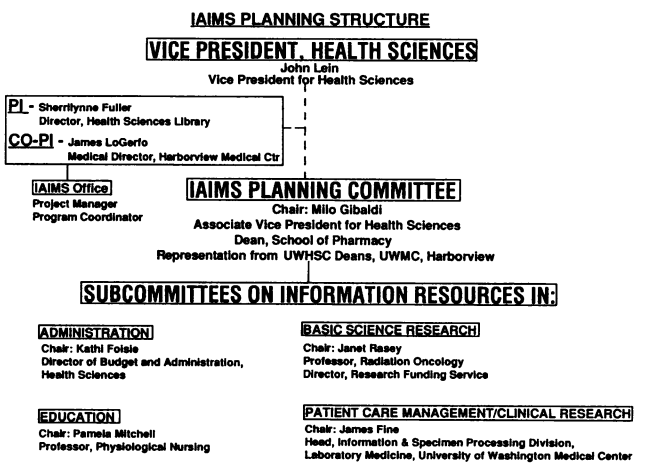
Another phenomenon we observed was the effect of heightened expectations of users. Library databases, including MEDLINE and the library's holdings catalogs, formed the central core of information resources initially made available online to faculty, staff, and students. Early and seemingly easy (at least to nonlibrarians!) creation of those databases led to rapidly rising user expectations. An initially grateful faculty quickly grew dissatisfied. Some individuals seemed to feel that, because it was so "easy" to create an online catalog or a local MEDLINE subset, developing an online patient record database should be equally straightforward. Many planning groups seemed to be discouraged by the complex task of creating electronic records based on untidy paper records consisting of both text and images. The process was complicated further by complex confidentiality and ownership issues. We felt it was important to establish a planning process that provided for realistic user expectations.

Another common experience was what we have termed the "no blank slate" phenomenon. In most health sciences centers, and especially at UW, it was impossible to begin at the beginning. Information systems and plans already were in various states of development, from planning through implementation. At UW, these included an ongoing project initiated by HSLIC to create a graphical interface to databases (WILLOW—Washington Information Looker-Upper Layered Over Windows), a project started by the Medical Center Information Systems to link clinical databases, MIND (Medical Information Networked Database), and the Digital Anatomist Project of the Department of Biological Structure. These efforts had to be taken into account in planning the IAIMS effort. Ignoring existing planning efforts and projects seemed risky, in that we might alienate the very people we most needed to create a successful institutionwide process.

The concept of integration and what it really means has been a central issue from the beginning of our planning process. *Integrated information system* is a politically charged concept in many academic health science centers comprising, as UW does, autonomous departments and schools. For us, it was very clear from the beginning that the word *integration,* particularly if used in the same sentence with *computers,* was verboten! As a result of UW's large research enterprise, many faculty members have their own sources of funding and are able to make their own decisions regarding computers, software, and local area networks. The idea that anyone could tell them what computers or systems to buy or, even worse, order them to make their own databases available to others was unthinkable. Thus, it was as important for us to know what *not* to say as it was to know what to say.

We recognized that, as relative late-comers to IAIMS

Figure 1
IAIMS planning structure



planning, we would face some of our greatest difficulties balancing between planning and ongoing projects. Many of the earlier IAIMS planning efforts were able to begin at the beginning. The extension of the planning process to encompass project development and implementation is normally neither easy nor natural. Individuals who are skilled at planning and willing to participate are not necessarily skilled at (or even interested in) implementing or managing new services or projects on an ongoing basis. Resource allocation for planning on paper raises few hackles. However, when planning leads to demands for real dollar commitments, and individuals who were a part of the planning process feel that they (or their department or program) did not receive their fair share, they may abandon the process.

Although we attempted to come up with predictions for the future, we decided that this really was fruitless. The rapid changes in both health care and technology mean that any forecasts are likely to be wrong. Indeed, we believe that our objective should be to create the future; that is, to envision a desirable future and then to find ways to make it happen.

In summary, analysis of experiences at other IAIMS institutions provided us with guidelines for our own planning framework:

- Keep in mind your institutional strengths and needs—no single IAIMS model successful elsewhere is likely to be the right one for your institution.
- Focus on people rather than technology. The user's needs must be at the center of the planning process.
- Maintain realistic user expectations—never try to minimize the complexity of the undertaking.
- Do take into consideration past planning efforts and ongoing projects. When it comes to IAIMS planning, there is now (if there ever was) no such thing as a blank slate.
- Be prepared to alter your terminology to fit the local institutional situation.
- Create the future; do not try to forecast it.

PLANNING STRUCTURE

We crafted our planning structure with the aim of promoting collaboration among diverse groups, each with its own agenda and priorities. Participants were drawn from all of the health sciences schools at UWHSC, Harborview Medical Center, and University of Washington Medical Center, as well as many of the allied centers. Researchers, educators, clinicians, librarians, policymakers, information technology experts, and administrative staff throughout UWHSC have met in various committees and focus groups to develop a strategic plan.

A Planning Committee, composed of appointees of the deans of the six schools and administrators of the two medical centers, serves as the primary advisory body. The associate vice-president for health sciences chairs the Planning Committee. Four subcommittees were established to address information resource and service issues in basic science research, patient care management/clinical research, administration, and education (Figure 1).

Committee appointments were made with an eye toward co-opting and leveraging existing planning efforts and projects. The composition of the Patient Care Management/Clinical Research Subcommittee is illustrative of this principle. When we received our IAIMS grant, integrated clinical database planning was well underway under the auspices of the Medical Center's Patient Care Network Committee (PCNC). To avoid interrupting the momentum of this committee, the IAIMS Patient Care Management/Clinical Research Subcommittee was structured around the PCNC. Membership on the IAIMS subcommittee includes the chairs of the six PCNC subcommittees focusing on patient care information, financial information, security and networking, ancillary information systems, medical records, and decision support. Also participating are individuals from each of the schools of the Health Sciences Center and the Health Sciences Library. This approach proved to be very effective, bringing individuals from academic programs together with their counterparts in the hospitals, in many cases for the first time. Communication, collaboration, and cooperation have been enhanced significantly throughout UWHSC. It is significant that this subcommittee is responsible for clinical research as well as patient care management. Clinical data generated by the hospitals are of great interest to researchers, especially in public health and

medicine, and the dual charge of this subcommittee helps ensure that, as clinical databases are created, their potential for use in research is kept in mind.

EDUCATIONAL AND MEDICAL INFORMATICS RESEARCH

As we began our planning process, we recognized that strong educational and medical informatics research programs were an essential underpinning of all the successful IAIMS sites. At UW, the IAIMS-sponsored Health Information Sciences Lecture Series features nationally recognized experts in biomedical communications, information science, and medical informatics from all health sciences disciplines. The IAIMS newsletter, *Vital Links*, publicizes information management and information technology activities, as well as relevant educational opportunities within UWHSC. With regard to research, an Interdisciplinary Committee in Health Information Sciences has been appointed by the dean of the graduate school. Committee members include faculty from medicine, public health and community medicine, biomedical sciences, cognitive sciences, computer science and engineering, library science, nursing, bioengineering, dentistry, and social work. This committee is developing a training program in health informatics and promoting an interdisciplinary medical informatics research agenda.

FITTING THE PIECES TOGETHER

Collaboration is a hallmark of a number of ongoing projects that support key elements of our long-range plan. These projects include WILLOW, MIND, and the Digital Anatomist Project. As at most other IAIMS sites, a uniform intelligent interface to databases is seen as highly desirable. WILLOW is a Unix-based, X-Windows graphical interface that takes advantage of current technology to provide an intuitive search approach for novices and a time-saving interface for intermediate and advanced users. Initial WILLOW funding was provided by a Digital Equipment Corporation Innovators Grant to Sherrilynne Fuller, IAIMS principal investigator. Although still in beta version, the interface is used on a daily basis by a number of beta testers. The university libraries recently decided to use WILLOW as one of the primary user interfaces for public access X-terminals. WILLOW corresponds very closely with specification for software in both university and Medical Centers Information Systems academic and clinical systems planning. WILLOW has great potential as a common interface for many university databases.

UW Medical Center and Harborview Medical Center have begun a major, long-term clinical automation effort. MIND is the clinical information systems component of the long-range plan, representing the coordination of several interrelated systems projects.

Image representation is a key research area at UW, and the Digital Anatomist Project is attracting national interest. The goal of the project is to develop a framework for dealing with structural information, or data and knowledge about the physical structure of the body, from the molecular to the gross anatomical levels. Anatomy and, more broadly, structural biology provide a fundamental framework for most of the medical sciences. If this framework can be codified and made available to every clinician, researcher, and student, then the foundation will be laid for integrating diverse biomedical information sources in a much more meaningful way than simply connecting different online databases through a common interface [4].

The project is an important component of our large-scale multidisciplinary plan for an Integrated Educational Information Database (IDEAL). IDEAL is seen as a system of fully integrated (text and visual) clinical, research, and educational databases to support individualized, interactive learning at all levels of health science education (undergraduate, graduate, continuing education, and professional staff development). The result will be an entirely new educational paradigm for the health sciences, one that transcends individual schools and basic and clinical medicine and one that leverages the latest technology in support of health sciences education for the twenty-first century.

CONCLUSION

As often noted by individuals involved in the IAIMS process, no institution has all the resources needed to build a comprehensive IAIMS environment. Every institution, however, is spending a significant amount of money on a variety of often isolated systems. Our IAIMS planning process provides a framework within which those involved in a variety of projects, from small-scale departmental plans to large-scale regional plans, can work together to build a strong infrastructure for collaboration. We recognize that no one individual or group can possibly provide all the necessary applications or services to support a truly integrated information environment. Our approach is to leverage, co-opt, and facilitate existing efforts, while working toward the long-range goal of an integrated, responsive information environment that meets the needs of faculty, staff, and students.

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