

The Management of Change: Lessons Learned from the IAIMS Experience

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The critical elements of the change process were designed into the strategic planning process and the pilot project for the Integrated Academic Information Management System (IAIMS) at the University of Maryland. These elements were: Support by the institutional leadership; a critical mass of interested participants from diverse groups across the organization, committed to the project and with ownership of the plan; a motivating level of dissatisfaction with the status quo; the construction of a scenario describing the desired future and an assessment of needs to achieve it; technical and consulting help; a pilot project with replicable features to demonstrate the concept and feasibility of the approach; and participation of opinion leaders initially with later identification of additional opinion leaders who would become part of the pattern of acceptance of the innovation and diffusion of the technology across the campus.

The Institutional Imperative

The medical field has yet to feel the full impact of the electronics revolution. For the most part it is too diverse and complex for outsiders with computer expertise to meet application needs of the professionals and scientists working in the fields of medicine without considerable personalized interaction. At the same time, it is clear that there is a lack of a critical mass of computer knowledgeable users within most academic medical centers.

The institutional imperative is to find a way to integrate information processing technology into the professional ac-

ademic setting so that the benefits of the information age can be harnessed to enhance research, patient care, education, and administration.

The outcome envisioned to meet this imperative is an integrated academic information management system, or IAIMS. At the University of Maryland at Baltimore (UMAB), this concept is being translated into a networked, distributed system with user-friendly, decision-support software which will enable professionals and scientists in the academic setting to organize data, extract information, develop ideas, and evaluate actions. Local area networks, and ultimately a campus-wide network, will be used to enhance communication so that information and ideas can be more easily and effectively shared. Information processing will be distributed and integrated across micro, mini, and mainframe computers with emphasis on the desk top computer as the end-user's window into the system.

End-User Computing

The complexity and diversity of the professional academic campus present unique challenges. The centralized model where data processing professionals assume responsibility for developing and maintaining systems and central data bases breaks down in the academic sector. Applications tend to be unique and too numerous to be developed centrally and thus automated solutions tend to be underutilized. When implemented, they tend to be developed locally by end users typically in isolation with little concern for compatibility with other systems.

The problem is not that end users are developing their own systems — this would seem to be a natural consequence of the diversity of the academic setting — but rather that the process is inefficient and the products usually cannot be integrated. At UMAB, we believe the problem lies in the centralized information processing model, and we are now evolving toward a decentralized system.

Our focus is “end-user” computing, academic professionals defining and developing applications to meet their own needs. To support this, the decentralized model disperses resources and shifts the main role of the data processing professional from development to consultative support. For a small cadre of technical personnel to support a large body of end-users, and for systems integration to succeed, the data processing environment must be more carefully controlled. This is accomplished by standardizing the tools and procedures used for applications development. The selection of a universal toolset and standard methodologies permits the campus to develop training courses and provide better and more efficient technical support. It also fosters sharing of developments and expertise and facilitates integration by providing a common medium for information and technology exchange.

The challenge is not only to plan, develop, and implement new technologies but also to foster the adaptation of existing structures (hardware, software, and personnel) to the support of end user computing. A crucial element is the adjustment of the core facility, a partnership of the Information Resources Management Division and the Health Sciences Library, to the decentralized model. The IAIMS concept is more than the acquisition of a microprocessor for every desk, but derives from the idea that whichever area is involved — education, research, patient care services, or administration — information must be put into the context of a system or systems which the average user can access easily and directly.

Thus, it is essential that the underlying concept of an IAIMS be supported by the leadership of the university and/or campus and that IAIMS expresses the information management philosophy of the institutional leadership from the start, and this consensus forms the basis for organizational change.

The Theoretical Basis of the Change Process

“Organizational change,” is defined by Lippitt as: “any planned or unplanned alteration of the status quo which affects the structure, technology, and human resources of the total organization” [1, p. 37]. Rogers and Shoemaker, Hersey and Blanchard, Lippitt, and Blake and Mouton [2–5], have modeled the organizational change process. Although each employs a different construct to explain the change process, on closer scrutiny it becomes apparent that for the most part the theories are relatively similar. The model of Hersey and Blanchard is an appropriate framework to present the evolution of IAIMS at UMAB [3].

They describe four levels of change: knowledge changes, attitudinal changes, individual behavior changes, and group

performance changes. They argue that the implementation of planned change at the group or organizational level is most difficult because of the necessity of changing customs, mores, and traditions.

To implement the desired change, they describe two possible change cycles: the participative change cycle and the coerced change cycle. A participative change cycle is implemented by making information available to the individual or the group, and encouraging participation in the process. In doing so, the individual or group may develop “ownership” of and become committed to the achievement of the goal [3, p. 160].

A coerced change cycle, on the other hand, relies on the use of power (usually position power) and force to bring about the desired change. This approach ignores important considerations about obstacles which members of the organization face when they attempt to innovate, the role of management in facilitating reduction of these barriers, the part members of the organization may play in creating and overcoming these obstacles, and about the possibility that some members may be negatively oriented toward change [6].

Mohr has similarly speculated that the inclination to be innovative will be in direct proportion to the availability of resources in a given situation and inversely related to perceived obstacles to innovation [7]. Obstacles may be the direct cost of the innovation (materials, equipment, time, and skills) or human factors — fears of organization members concerning their value, their job security, professional autonomy, and their self-esteem.

Mintzberg, for example, has characterized part of the problem in moving the professional to adopt a new technology such as the computer in that to do so causes them to sacrifice a part of their professional autonomy — the individualism that may have prompted them to become a professional in the first place [8]. In Mintzberg’s opinion, a professional bureaucracy, or “collegial organization,” is an organizational configuration that emphasizes the authority of the professional — the “power of expertise” common in universities, hospitals, school systems, accounting firms, etc. In these settings the professional operates in an atmosphere relatively free from supervision and interference due to the complex nature of his work. The possibility of a single, unified strategy for decision-making and change is remote and the strategies that do exist are largely a reflection of individual initiatives on the part of the organization membership. He observes that “given the autonomy of each professional, his close working relationships with his clients, and his loose ones with his colleagues — it becomes sensible to think in terms of a personal strategy for each professional” [8, p. 364].

The key to change in these settings may be the involvement of key individuals from the organization who may adopt and endorse change — thus speeding the adoption of the innovation by other individuals. Downs, in a survey of innovation in bureaucratic organizations, cited the existence of a key, ideologically committed director within the organization as instrumental in bringing about or-

organizational change [9]. A similar observation was made in the extensive review of innovation in health care organizations conducted by the National Institute of Mental Health which observed that in addition to a creative and innovative leader, it is equally important for an organization to identify and utilize "early adopters" who can play a key role in influencing colleagues to try and then adopt selected innovations [10]. In these and other studies of organizational change, the key individuals are viewed as holding positions of influence in both the formal and the informal communications networks.

Findings of these and other studies indicate that within some research and academic settings information concerning new innovations such as computers enters the organization unevenly and tends to involve a small number of key individuals who may serve as a catalyst in the innovation process [11–15]. These individuals, or "innovation opinion leaders" are communication "stars" in that they are central to the communication network and are often credited by their colleagues as being the source of the best technical ideas and information [16]. Leadership in this context is based on the individual's technical competence, social accessibility, and conformity to the organization's norms rather than on the basis of formal position or status within the system.

The Critical Elements of the Change Process

IAIMS is directed toward large systems change at the institutional level and has targeted the institutional environment as a whole. The IAIMS initiative has three basic phases: strategic planning, pilot development, and implementation. (The seminal strategic planning phase was supported by a competitive contract from the National Library of Medicine, and the pilot project has been supported by a follow-on resource grant made in October, 1985.) IAIMS strategic planning required the institution to develop a blueprint, or map, of where it wanted to go and how it wanted to get there. It addressed the physical needs, namely, systems architecture and hardware and software that were needed, IAIMS has affected decisions relative to the enhancement of communications and information processing throughout the institution. It defined the attitudinal and behavioral changes that had to occur among faculty, students, clinicians, and administrators, and promoted the establishment of a strong consensual base among faculty and staff about the use of computers and communications technology. IAIMS stimulated the campus to identify and plan what changes should be made in the future—a striking example of the strong influence of outside forces in catalyzing change.

In its initial proposal in the fall of 1983, UMAB presented the concept of the "vertical slice" as a manageable first implementation step. The vertical slice represents the model development stage and has been designated specifically as the "pilot project." The pilot project will run for a three-year period and will set the scene for the broader implementation throughout the campus to follow.

The University of Maryland Hypertension Center, an interdisciplinary "center without walls," was selected as the pilot site or vertical slice of the organization. This center involves people and resources that cut across the spectrum of departments and schools. Thus, the products and methodologies developed in the prototype will have direct applicability to the campus as a whole and will be transportable to other sites in a phased branching process.

Phase Three, full-scale implementation, can take place only after plans for phased branching have been developed and resources have been made available to acquire the necessary hardware and software for large-scale implementation.

Support from the Top Level Administration

IAIMS development at UMAB has been characterized as "top down planning" and "bottom up design." The process was initiated by the former Chancellor, Dr. T. Albert Farmer, who appointed the principal investigator and the co-investigators, supported their leadership roles, and personally disseminated the message about his vision to transform the campus and charged them to carry out the strategic planning process. It was acknowledged that major attitudinal and behavioral changes must be forthcoming to accomplish the envisioned outcomes. It was clear from the outset that there must be a broad involvement at all levels across the campus. It was also clear that it was essential to build a strong consensual base.

The Consensual Base

In order to develop the necessary consensual base and to achieve a "bottom up design," a participatory committee structure of faculty and staff was created. A plan development committee was selected with the authority to speak for the six professional schools, Medicine, Dentistry, Nursing, Pharmacy, Social Work and Community Planning, and Law; the University Hospital; and the Maryland Institute for Emergency Medical Services System (Shock/Trauma) with authority to commit their respective units to the strategic and long-range plan and design of the information systems. This was the group which actually authored the strategic plan published in the spring of 1985.

Steps in the Process

First, opinion leaders were selected from across the campus for key positions in the project. They represented a broad base of individuals with authority in their organizational units and/or expertise in a given area of the operation, in computer applications, or information sciences. A critical mass of individuals then became committed to the project through their ownership of its objective and design. It was this group of individuals who were sufficiently dissatisfied with the status quo to want to change it, who diagnosed the present state of the information systems capability, developed the scenario of the desired state in the future, and developed the action plan to take us there.

In addition, a study has been undertaken to identify a cadre of additional opinion leaders who will set the course of the branching or diffusion process. These individuals have been identified by their peers as leaders in the area of computing. Their position of esteem will place them in an excellent position to aid in diffusing the technologies developed in the pilot. They will also assist in the selection of software tools and in the evaluation of pilot activities.

The “Fit with Change” Theory

According to Arms, for major change to occur in an institution three factors are necessary: leadership, excitement, and the ability to move the process of change rapidly [17]. A commitment from top leadership on the campus from the beginning enabled us to draw upon the Chancellor’s office, key administrators in some of the schools, academic faculty, and technical staff. Administrative leadership was provided by the Chancellor, deans, and other senior officials who were responsible for obtaining the resources to do the project—namely, the preparation of the contract and grant proposals, and their presentation to the outside review groups. The establishment and staffing of the necessary committees, and the management of the process from top to bottom and back to the top again then followed.

Academic leadership for the four functional study groups was provided by the chairman of a major basic science department who headed the research committee, the Associate Dean for Medical Education who headed the education committee, the Vice President for Nursing at University Hospital who headed the patient care committee, and the Associate Dean for Administration of the Law School who headed the management committee. The technical leaders, the Director of the Health Sciences Library, and the Associate Vice Chancellor for Information Resources and their staffs, as well as an outside consulting firm, helped the faculty and the academic administrators in the development of the plans, applications, resources, estimates, needs assessments, and future scenarios.

Arms indicates that you cannot underestimate the value of excitement in creating momentum to spur institutional change and points out that the things which contribute to that sense of excitement about the computing process include the acquisition of personal equipment, easy and important applications, and the delegation of decision making and application of resources to the local level [17, p. 102]. The excitement or commitment to the project has been seen in the dedication of time on the part of busy people and the allocation of material resources, primarily funds from other grants and contracts to the enhancement of the networks and the acquisition of the information networks and general capability.

There is a down side to the process, and we have experienced it as our core facilities have become somewhat overloaded with many demands on their time and capability. Arms pointed out at the AAMC Symposium on Medical Informatics that “failures in basic support services will sub-

stantially affect participation and commitment;” this is clearly the case and is an ever present danger [17, p. 102]. Fortunately, we have had the support from the NLM contracts and grants to carry us forward, but limited personnel and commitment to many projects make it difficult to sustain the necessary level of activity and focus. Also, over time it is necessary to reinforce the implementing philosophy to sustain the momentum. Also, the changing fortunes of the University do not always permit the investment of the financial resources on the scale required for large scale implementation in the time frame many people would like to see. It has been fortuitous that early participants have been willing and able to contribute energy, time, and some material resources to match in kind the outside support. The university will have to have a plan to continue to engender this type of participation as it moves toward large scale implementation as well as providing the wherewithal to develop the next phase and maintain a substantially larger base of support for certain core facilities and the network structure. Outside support on a project basis is by definition time limited, and long-range support will have to come from general funds or endowment.

There is evidence that this commitment will be honored. For example, Dean’s Office funds, funds available for the development of research support initiatives to enhance research capability, and similar support for educational endeavors have been applied to various enhancements of the information systems and resources of the campus, all of which are supplemental to IAIMS. It was estimated that for every dollar received from the granting agency (NLM), three dollars of time and effort was expended by faculty or staff on the activity. This ratio probably holds today with the implementation of the pilot project.

Summary—and a Note of Caution

Many of the elements of the change process were anticipated and were in place or were designed into the strategic planning process and the pilot project.

- Support of the institutional leadership
- A critical mass of interested participants from diverse groups across the organization who became committed to the project and felt ownership of the plan
- A picture of present status and a level of dissatisfaction with present status
- Needs assessments and a picture of the desired future
- Technical and consulting help
- A pilot project with replicable features to demonstrate the concept and feasibility of the approach
- Participation of opinion leaders initially and later identification of additional opinion leaders who would become part of the pattern of acceptance of the innovation and further diffusion of the technology.

An evaluation methodology is being implemented along with the pilot project. The stimulus external to the institution for large system change was critical.

A word of caution directs attention to the danger of overloading already limited core facilities, and the need for university foresight in anticipating the time when maintenance of fullscale implementation is required if outside funding cannot support ongoing operations beyond the research and development phases.

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