Questions and Answers

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John Paton, Yale University—What are the mechanics of introducing an architecture into an institution? How do you actually go about doing that?

George Hripcsak—The technical task of defining the architecture is not the hardest part. The challenges lie in leadership and resource planning. There needs to be someone at the institution who is an information architect, someone who can communicate a vision and redirect millions of dollars. That is done through the processes outlined in Mark's and Joyce's talks. The technical challenges are fairly small. My last diagram may make the architecture appear to be complex. After you get into it and work with it for a little while, it is actually fairly simple.

Joyce Mitchell—The key is organizational. During our planning process, we came up with a view of the architecture that was very similar to that outlined by George. It has been difficult to enforce adherence to the architecture because of our organizational structure. You must have control of the resources that go into the major components of the architecture before you can make the whole thing fit together. It requires a combination of a carrot and a stick. The carrot begins with the vision of the future, the common planning, and making people feel that their voices are heard and that the vision is achievable. But there also comes a time when a stick is needed. You have to look at your investments and ensure that everyone is heading in the right direction.

George Hripcsak—There are two approaches to introducing an architecture—the five-year-plan approach and the free-market approach. The five-year-plan approach requires that you have institutional control. You then outline a plan stating the most efficient way to achieve the organization's goals. The free-market approach is to put into place the network and related

infrastructure, set up guidelines, and then wait to see what happens. We experimented with these two approaches at Columbia. The clinical system was a planned approach, and everything else was free-market. As a result, the clinical system came up very quickly and is working very elegantly. This does not mean that the other systems are bad, they just didn't move as quickly. On the other hand, there has been creativity in the free-market systems that we never would have gotten from our central planning office.

David Rodbard, Association of American Medical Colleges—When I was at NIH, we had 23 institutes, each of which had at least one architecture. We used an outside facilitator to help working groups to develop a common strategy. Are others using outside facilitators?

Joyce Mitchell—We have used outside facilitators. Where it helped most was in bringing the hospital information systems group, our hospital CEO, and our hospital CFO into the process. During our planning phase, we identified the electronic medical record as a priority. It was at that point that the hospital team realized the IAIMS was going to impact them. Next, we devoted the time necessary to get them to agree to spend their money to hire facilitators. The facilitators led an intensive four-month planning process, looking at what we should do with all aspects of the hospital information system. The result did not say, "This is how we're going to build an electronic medical record." Instead, it identified our business initiatives and said, "This is how we're going to use IT to focus on addressing those initiatives." The process was time-intensive, but we came out with a plan that everybody understands and supports. We could not have done that without outside facilitators.

Mark Frisse—I would add two comments—one so-

cial, one economic. Many of us face situations where doing the right thing offends so many people that it is impossible to lead directly. Sometimes even the act of coordinating is taken as an attempt to seize power. In those instances, there is no substitute for bringing in an outside facilitator. That is the political and social reality. The second comment is economic. Karl Marx, said, "The workers will never be able to seize control of the factories because they don't have the capital to do it." That is exactly the state of the health professionals right now. They cannot compete without access to clinical information; the barrier to entry is too great. People are realizing that the only way to succeed is to join forces with someone who is able to provide that information. The person who has the resources (human resources and economic resources) to manage clinical information is going to carry the day.

Ed Hammond—Are CIOs born or created? At a recent NLM training grant directors' meeting, the issue of whether it is appropriate to use NLM training funds to train CIOs was raised. Where do these individuals come from, Joyce?

Joyce Mitchell—At this point, there are no CIOs who were born to that role. They have been cultivated. There are no CIOs who started their professional careers intending to be CIOs, because that title and job description have not existed long enough. The CIOs whom I know came into it from different career paths. When I was in graduate school training to be a geneticist, I never thought I would be concerned with change management and process and role models in IT. That is a long way from where I started.

Ed Hammond—Are CIOs trained, or are they just appointed?

Joyce Mitchell—They have to be trained. If they don't understand the technology, they cannot do the job. They have to be very good at working with people. CIOs can be trained just as we have been trained.

George Hripcsak—A person must have a basic talent to start with, but also training has to be provided. Otherwise, that person is going to end up in another field. If we want individuals to come into medicine, we have to bring them in actively.

Mark Frisse—I don't know how often CIOs are born or are made, but I do know that they are often fired. That speaks to the issue of training, as well as to the issue of the institutions. I was not a part of the NLM discussions, but I think for that institution to do its

job, it must take a very broad-based approach with respect to business economics, utility theory, decision analysis, and information technology in health care to provide training for these people.

Bill Stead, Vanderbilt University—What percentage of CIOs understand that they need an architecture, and the fact that they, themselves, have to put the architecture in place because no vendor is prepared to do it?

Joyce Mitchell—All of the CIOs at this meeting certainly understand that concept—many other CIOs do not. What does the title, CIO, mean? There are a number of hospital people with CIO titles who feel that their job is to buy components and to interface them. I doubt that they know what an architecture is. The IAIMS concept makes people think about architecture much more than does traditional data processing.

George Hripcsak—One gauge to measure how the architecture idea has penetrated is to listen to consultants. Five years ago, consultants were not talking about these concepts. Now they want to come and explain the architecture to you. They don't think it should be done internally, they want to do it for you.

Valerie Florance, University of Rochester—What can we do to sustain enthusiasm and interest in planning after the excitement of coming together and participating in the initial planning phase?

Joyce Mitchell—Planning has to be an ongoing process. We identify initial priorities and start to work on them. While that work is in progress, we plan for the next phase. Committee structures are important. The committees may change along the way depending upon what is being done, but there also needs to be a permanent planning office. At Missouri, the position of IAIMS Coordinator is evolving into responsibility for managing an office of planning, evaluation, and dissemination for the IT organization. Vanderbilt is doing the same thing.

George Hripcsak—Columbia University Medical School has about a $300 million budget, and the hospital has about $700 million. There are probably a dozen different offices with the term "planning" in their titles. As frustrating as it may seem, this duplicate effort is necessary to sustain interest in the plan. Everybody rediscovers the plan and thinks it is their own idea. This is healthy, because it has been said that, "The only way to get your idea across is to make it the other people's idea." As individual groups discover IAIMS on their own, they can be herded in. Suc-

cess then comes from adding incremental value to the collective insights as opposed to starting over every time.

Kevin Johnson, Johns Hopkins University—How has the changing marketplace and your interactions within your region caused each of you to change the scope of your IAIMS?

George Hripcsak—At Columbia Presbyterian Medical Center, we are merging with New York Hospital. We are merging the faculty plans at the two universities and redefining our scope. Thus, we are compelled to redefine our IAIMS completely. We are reaching out to the community more, and most of our new planning focuses outside the hospital.

Joyce Mitchell—We are redefining the IAIMS at Missouri, although the changes in the market place began to occur when we were in the middle of the planning process so it doesn't feel like redefinition. The change is reflected in our telemedicine activities and in other links to the rural and agricultural parts of the state. We have external sites that are part of our organization. It is often difficult to know who is and who is not a part of our system. A problem that we have had to face is, "How do you change what information services are delivered depending upon to whom the service is delivered?" This requires a database of users and a database of roles within our organization in order to implement a role-based security model. Then we can manage what information can be accessed by what people. That is our vision of how to deal with it; all the pieces are not in place yet.

Mark Frisse—Since every part of the enterprise is dependent upon information technology, whether or not it is called IAIMS, you can't be involved in all of it. You have to take the advice of (I think it was) Jack Welch at General Electric, "If you can't be number 1 or number 2, don't do it." You go where you can see a return, where you think there is something critically important to be accomplished. You have to start with some wins that are immediate and apparent and visible. We are defining the scope of our IAIMS to focus on what we think makes the most difference, the interface between the school of medicine and the hospital. That will not happen without IAIMS; the rest will happen by other means.

Bill Stead, Vanderbilt University—The change in the marketplace is altering the way we at Vanderbilt tackle problems. Our first objective was inreach, trying to solve problems internal to Vanderbilt. We knew

at the beginning that we would want people outside Vanderbilt to be able to reach into Vanderbilt to interact with information about patients under our care. We now understand that we need to go a step further. If we are going to be information producers, and if we are going to be experts in informatics, we have to provide components of infrastructure that can be used by others across the region, whether those others are affiliated with us or compete with us. They have to be able to incorporate our components into their internal systems. As our relationships change, we need to dynamically, on-demand, link or not link the information so that it can look integrated or not integrated. Fortunately, our architecture has allowed us to create reusable components, which we should be able to be transfer externally. Planning for that type of inter-organizational interaction is more complex than what we had to do within Vanderbilt.

I ask the three panelists to consider the perspectives of IAIMS that they are representing and to tell us how they would start with planning, architecture, or organization to establish a regional or national inter-organizational IAIMS. What would be the first step from each of those perspectives?

Mark Frisse—I think IAIMS is local. It is opportunistic. It requires good luck, and there is no substitute for having at least one person spearheading it who is supported by the institutional leadership. If that is not possible, having someone who is identified as a clearinghouse is a key first step. Understanding your limitations is important, as is knowing where you can make a difference early into the process. Given the fragmented nature of our institution, our approach has been one of opportunism. We have succeeded in putting people in hybrid positions within the organization. Progress occurs, but not in the way that the classic Matheson and Cooper article would have articulated. This strategy should also work at the regional level.

Joyce Mitchell—An inter-organizational effort must be spearheaded. To get people from different schools, different hospitals, different integrated delivery systems to cooperate requires that they sit down together and get to know each other. In order to define a common direction, individuals have to understand what other individuals are presently dealing with and their points of view. Individuals have to communicate either electronically or physically. It is difficult to dictate anything within the academic environment; it is easier within the hospital environment because the hospital is traditionally more organized.

Mark Frisse—Somewhere in the middle of those two settings lies the answer. In a rapidly changing environment, some organizational chaos can allow small mistakes that show what is working and what is not. An evolutionary approach may be preferable to where some health care systems are headed. They are going to make well-orchestrated, well-financed, highly effective, catastrophic errors. They are like giant cannons pointing in one direction; they are going to shoot whether it is the right direction or not. A little bit of chaos might be helpful.

George Hripcsak—If you have a good architecture, you are on the road to success. If you don't get the architecture right, you're doomed. Without the right underlying architecture, a CIO can have the most proactive rhetoric you have ever heard, but be inherently, 100% of the time, reacting. Without the basic architecture, CIOs are totally trapped in legacy systems. They can never get out. They can never do anything other than just react to yesterday's problem.

Ed Hammond—It seems that each of you expects the medical schools to be the instigators of regionalization. That is not going to work. There will have to be an identified neutral authority to provide the platform where people can come together and work. The academic side, the medical school, is too far removed from the nonacademic environment in terms of the art-of-the-possible and in terms of what they believe needs to be done.

Mark Frisse—I agree that it is generally the hospitals and health care systems that are the drivers of change. The medical schools, in most instances, are totally reactive and have very little money and very little organization. The neutral-person model may not work either. A more viable alternative may be one person who reports to two masters or a group of people who get along well together.

Peter Tarczy-Hornoch, University of Washington—How do we help physicians who have grown up in a legacy system environment to understand the opportunities of an environment in which they can redesign processes and work differently? Given the fact that everyone has started with a legacy architecture, how do we proactively transition to a new architecture?

George Hripcsak—There are two ways to move to a new architecture. Some people have the luxury of starting from scratch—that is obviously one answer. The other way is one step at a time. As each new step is reached, the institution moves forward a little without being aware that it is moving. Much of the architecture is conceptual; therefore, not all systems need to change. Sometimes minor adaptations can make the old systems fit into a better architecture.

Joyce Mitchell—Incremental work is also possible in terms of organization. If an employee leaves, and there is a plan toward which your organization needs to move, change can be achieved as that employee is replaced. I am notified every time a position with an IT title is vacated. I initiate a conversation with the hiring department to determine whether we can do something cooperatively rather than having them hire a person autonomously. Sometimes it works and sometimes it doesn't, but we usually move in the right direction just by having that conversation. When you get external money, there are opportunities to do things faster. Because of our IAIMS planning process, we were ready to move when the University of Missouri said they had money to provide campus-wide support for end-user computing. I can use that support to split-fund positions without having to extract the positions back to the individual departments. The departments don't see any net loss.

George Hripcsak—The planner would now say to a medical school, "Consolidate all of your billing systems if you haven't already done so." "If you have not established your master patient identifier, do it now." "Establish a clinical data repository program that is fed by your legacy systems." "Don't spend a lot of time with the computer–human interface without getting the back end right."

Joyce Mitchell—There are some other things that need to be mentioned. You need to pull together all of your transcriptionists now so that you can eliminate FTEs as the role goes away. People have secretaries who do secretarial work, answer the phone, and transcribe at the same time. Separate those roles and figure out which roles are going to disappear in the long run as you squeeze costs out of your system.

Tom Rindfleisch, Stanford University—How can the planning model accommodate the rapid change of technology?

Mark Frisse—If you are referring to a centralized computing facility, it is destined to fail when economics get tight. You either provide marginal services at marginal costs and eventually run into capacity problems, or you try to allocate the fixed costs. The inability to see ahead can be dealt with by a process that allows small mistakes in a supportive environment, where you can pick people up and learn from the mistakes. A highly monolithic plan is much more likely

to result in large catastrophic failures.

Joyce Mitchell—We should avoid becoming fixated on any one piece of technology—it is going to become obsolete. However, a bigger failure is to not do anything because you are paralyzed by the fear of everything changing underneath you. What we hope for is to have some successes along the way, and that enough people recognize the value of those successes, so that we are not crucified for our failures.

Bill Stead, Vanderbilt University—Putting in systems that become obsolete is not a failure. We are replacing shared workstations in the hospital and clinic on a three-year cycle. We budget for depreciation with that expectation. We do the same thing with network technology. Most of our electronics are now four years old, and we are replacing about a third of them this year. We knew that we would have to do that—it was part of the plan. The architecture gives us that flexibility to evolve because we can do the replacements in pieces.

Ed Hammond—What do we expect the vendors to do? It almost sounds like a hopeless situation from their perspective.

George Hripcsak—The vendors are producing good modules that can be plugged into other systems. No vendor currently can provide an architecture across a medical center. The consultants are the ones who should be doing that, not the vendors of individual software. The consultants who are trying to fulfill that role are not successful. They are looking for technology problems that require technology solutions when it is planning, resources, and leadership that are needed.

Mark Frisse—I have been impressed by the extent to which IBM has adopted open systems in terms of HL7, databases, and HTML front-ends. There are better things to buy all the time, although I confess I still don't know how to make the little ambulatory care systems talk to the other systems. It seems that a lot of vendors will fail, and some of us will fail with them.

Joyce Mitchell—The vendors don't know nearly as much as those of us here about the direction for the future. Yet, to decide that you are going to build everything yourself is digging a hole so deep you could never get out of it. You have to find the right vendor who is willing to work with you. We are in the process of doing that right now. Our approach is to look at the functionality of current systems, but to put greater emphasis on the long-term vision of the corporation and its leaders in terms of where they think health care is going, where they think technology is going, and how they are planning for the future. We want to know what they think they will be doing five or ten years from now. It is almost like buying futures in the vision of the company. You have to pick a company that either is going to be around or is going to be acquired because they have the right vision. We don't yet know whether our approach will work because we haven't actually gotten to the step where we choose a company.

Bill Stead, Vanderbilt University—You need to categorize vendors by the types of products they sell. The health care software vendors have not built a strategy around open systems. They are buying a set of niche products so that they can claim to have a complete solution. This is the wrong answer, because the products do not work well together. The real question is whether Vendor A's product accepts a plug-in module from Vendor B. The health care software vendors do not buy into this concept. There is another set of vendors who are information-technology-based. The health care industry has not taken advantage of these vendors. To the degree that people are building technology solutions that plug and play nicely, they give an institution the ability to plug the pieces together in the way they want their architecture to look without having to build very much at the institutional level. This is the model that will likely emerge. I believe that the current health care software vendors will be replaced by a mixture of consultants and information technology companies.