Koop Foundation, Inc.

Middleware Solution To Provide Cost and Access Advantages

By the early 1990s, after decades of evolution, the healthcare industry was operating as a fee-for-service system that provided financial incentives for repetitive care. Then the healthcare industry began to see trends toward consolidation and cost containment as payers such as the Federal Government and private insurers started limiting reimbursement. Providers, who found cost cutting extremely difficult, began to pare services to Medicare and Medicaid recipients. The Koop Foundation, with co-funding from ATP, formed a joint venture to create middleware, called Health Object Library ON-Line (HOLON), which could enable information technology migration to systems useful in the emerging integrated delivery system. The joint venture met all technical goals and held successful testbed demonstrations of the middleware. Lumina Decision Systems incorporated the technology into new decision-support products. Shortly after the ATP-funded project ended, however, healthcare industry dynamics changed so drastically that full commercialization did not occur, and Koop Foundation ceased operations.

COMPOSITE PERFORMANCE SCORE
(based on a four star rating)
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Research and data for Status Report 95-10-0067 were collected during April - June 2002.

Existing Practices Limited Efficiency of the U.S. Healthcare Industry

In the early 1990s, the nation attempted to move to a universal healthcare system. That effort drew industry attention to the need to control costs, reduce duplicative testing, and provide high-quality care throughout a patient's lifetime. The need to share information became apparent, but patient records were maintained within individual physician's offices, and each visit to a new physician required that patients undergo many repetitive, basic tests. Information systems could not communicate with one another, medical records could not be accessed quickly, and dynamic best-practice care paths were not available to providers across individual information systems, much less across the industry as a whole. This technological hindrance impeded migration to an integrated delivery system.

As of 1994, medical spending exceeded $938 billion; 20 percent of those costs were related to the processing of information. Payers, such as Medicare and private insurers, were just beginning to scale back reimbursement for medical services to limit redundant care. In an attempt to negotiate more favorable reimbursement terms from payers, the healthcare industry was beginning to consolidate, to control costs by eliminating excess staff and services, and to lock patients into health maintenance organizations (HMOs). At the same time, distributed patient data and isolated information systems applications were restraining the evolution of healthcare informatics. Capturing the cost savings would depend on moving from closed, proprietary applications toward open, rapidly customizable software.

Koop Foundation Forms Diverse Joint Venture

The Koop Foundation formed a joint venture in response to the ATP focused program, Information Infrastructure for Healthcare. ATP requested proposals in this area for three main reasons: wide-ranging partnerships were needed to advance the state-of-the-art; significant technical challenges were associated with the development of medicine-related tools; and the resulting new technologies would provide significant economic benefit to the U.S.-based healthcare market.

The joint venture participants included diverse points of view: providers, patients, community service agencies, and information technology developers. Koop Foundation's responsibility was overall project management. The following health systems and companies participated in the joint venture:

- o Beth Israel Deaconess Medical Center, Boston, MA

- o George Washington University (medical center), Washington, D.C.

- o Norwalk Hospital, Norwalk, CT

- o Windom Health, Berkeley, CA

- o Concept 5, McLean, VA

- o Lumina Decisions Systems, Los Altos, CA (relocated to Los Gatos, CA)

- o Meta Software Corporation, Cambridge, MA

- o Oracle Corporation, Bethesda, MD

- o Wizdom Systems, Inc., Alexandria, VA

- o @Home, Redwood City, CA

Other firms that participated in the joint venture, but later became inactive or withdrew, included Talisman (Foster City, CA), ForeFront Group (Houston, TX), IntelliTek (Rockville, MD), and Time Warner (Maitland, FL).

Middleware Solution Provides Cost and Access Advantages

Rather than force providers and payers to adopt single software platforms (a notion that would necessitate unacceptable levels of Federal control) the possibility of "middleware" operating between the core data and the myriad existing information systems became an attractive option. Middleware had the advantage of ensuring universal access to usable patient and procedure data within legacy systems and is less expensive and less restrictive than total application

migration. The Koop Foundation joint venture was formed to create a library of reusable middleware software objects. These objects would allow developers to:

- o Design efficient new systems to focus on integration and cost control

- o Plug in desired components

The tools would allow providers to:

- o Collaborate across the industry

- o Use online multimedia healthcare information to anticipate wellness- and care-related issues

- o Access and manipulate distributed health information online in any form (e.g., text, video, data, telemetry, or image), at any time

Software objects to be developed included:

- o Advanced user interfaces that enable access anywhere, anytime

- o Natural language translation ability to ease data flow

- o Decision support to control costs and manage care paths effectively

- o Legacy system wrappers to avoid needless migration expense

- o Intelligent agents to search for and locate disparate pieces of information

ATP Funding Makes Koop Foundation's Technology Possible

The Koop Foundation designed its joint venture proposal to create an information technology process that could be shared and accessed across the entire healthcare industry to enable the provision of cost-effective, high-quality care within an integrated delivery system. The public benefits of a successful project (tremendous cost savings spread across the industry

and among diverse stakeholders) would be substantial. Because it would have been difficult for private firms to capture many of the benefits derived from the technology, ATP support was important in stimulating this industry initiative and in fostering the collaborative environment of the joint venture.

The Koop Foundation pledged to build open-source software and to distribute information on business process reengineering via the Internet. By using open distribution, even if the project failed, substantial knowledge spillover would occur throughout the healthcare industry. Moreover, entire new industries could develop to enable rapid access to the data. Those access devices envisioned in 1995 included stand-alone kiosks, wireless personal digital assistants (PDAs), interactive televisions, touchscreens, and information-rich text messengers.

ATP support was important in stimulating this industry initiative and in fostering the collaborative environment of the joint venture.

Given HOLON's fit with the healthcare industry's information infrastructure needs, and the potential for broad-based economic benefits across the U.S. economy, ATP awarded the Koop Foundation's joint venture $9.9 million in cost-shared funds to conduct research and to develop a proof of concept for middleware for the healthcare informatics industry.

Koop Foundation Overcomes Technical Obstacles

The idea of middleware was not new at the time of the HOLON project. In fact, there had been partial solutions to the healthcare informatics industry's middleware needs before the ATP award.

By project closeout, the Koop Foundation joint venture had developed several middleware tools.

HOLON sought to incorporate into the middleware as many of the previous solutions as possible and then to add further functionality.

The most significant technical risk involved the need for complex decision-support tools and intelligent search agents that could push useful information to end users without requiring additional search time. The decision-support tool, managed in part by Lumina Decision Systems, required several generations' worth of evolution of standards for medical lexicon, patient information, healthcare objects, and medical logic modules with extensive processing capabilities. The joint venture team created an innovative approach to the back-end Oracle database that successfully enabled decision support. Once the programming was developed to allow decision support within the Oracle database, similar identifiers were then incorporated to enable the intelligent search feature.

The HOLON project included three major testbed deliverables that demonstrated full functional capability. The testbeds grew steadily in size and scope with each successive year.

o The first testbed was the initial version of HOLON, with minimal functional capability for each of the layers of the architecture.

o The second testbed, HOLON version 2, was able to examine a limited form of real-time, data-driven, medical-decision support. It also demonstrated the internal capabilities of natural language search processing, transcription, and speech synthesis.

o The third and final testbed included all functionality, full privacy and security components, and automatic intelligent "anticipatory" data retrieval on patients, illnesses, cost, and care paths.

Conclusion

By project closeout, the Koop Foundation joint venture had developed several middleware tools. Lumina Decisions Systems incorporated the technology into new decision-support products. The joint venture also provided public access to much of the knowledge developed as part of this ATP-funded effort through a series of symposia, reports, and conferences on healthcare informatics.

Although the information generated by the joint venture was available to healthcare market participants, by the time the ATP-funded project ended in 1999, the healthcare industry had undergone a drastic change. The industry's consolidation and cost-control efforts had increased dramatically between 1995 and 1997; however, by early 1998, the national attempt to forge a universal healthcare system had failed, the idea faded from industry discourse, and the largest and most aggressive healthcare industry consolidators were under investigation for overcharging Medicare and Medicaid to cover cost overruns.

Industry changes propelled the healthcare marketplace beyond the Koop Foundation's ability to provide a useful service.

The consolidation trend slowed and information systems constructed to allow consolidation became less useful. By late 1998, industry changes had propelled the healthcare marketplace beyond the Koop Foundation's ability to provide a useful service. The Koop Foundation, Inc., ceased operation in 1999 for reasons unrelated to the ATP-funded project, and the middleware products are no longer available to non-joint-venture participants.

PROJECT HIGHLIGHTS
Koop Foundation, Inc.

Project Title: Middleware Solution To Provide Cost and Access Advantages (Health Object Library ON-Line (HOLON) Project)

Project: To develop an essential middleware framework for the healthcare information infrastructure, including a general architecture that specifies the organization, functions, and interfaces necessary for healthcare middleware and a library of reusable objects to support companies in developing healthcare applications.

Duration: 11/1/1995-4/30/1999
ATP Number: 95-10-0067

Funding (in thousands):

ATP Final Cost	$ 9,882	49%
Participant Final Cost	10,090	51%
Total	$ 19,972	

Accomplishments: This project successfully developed and demonstrated healthcare informatics middleware applications for use within the healthcare marketplace. The system used open architecture in an effort to speed up industry adoption of new information technology applications that could make business goals a reality. The Koop Foundation's joint venture addressed and overcame long-standing barriers to the evolution of healthcare information systems and provided the following benefits:

- By creating effective middleware, the joint venture enabled legacy systems to remain in place for the remainder of their normal useful lives, potentially generating significant cost savings that could be used to acquire new information technology assets.

- The joint venture also extensively modified a standard Oracle database to allow constantly evolving decision-support software on top of the information management capabilities of the HOLON system.

- The joint venture's detailed, intelligent search capability created additional time savings for those in the healthcare market.

The technology also was shared in the form of Internet resources, conferences, symposia, traditional papers, and presentations.

Commercialization Status: Lumina Decisions Systems incorporated the technology into new decision-support products. Changes in the healthcare marketplace,

however, prevented commercialization of the results of the Koop Foundation's joint venture. Aggressive cost cutting had not proved successful for healthcare providers, and a universal approach to healthcare delivery had faded from the national scene. Middleware designed to enable integration and aggressive cost control, therefore, no longer had a role in the marketplace.

Outlook: Because the middleware products are no longer available to non-joint-venture participants, the outlook for this technology is poor.

Composite Performance Score: *

Company:
Koop Foundation, Inc.
Rockville, MD
(The company is no longer in existence.)

Joint Venture Partners:

- Beth Israel Deaconess Medical Center, Boston, MA

- George Washington University (medical center), Washington, D.C.

- Norwalk Hospital, Norwalk, CT

- Windom Health, Berkeley, CA

- Concept 5, McLean, VA

- Lumina Decisions Systems, Los Altos, CA (recently relocated to Los Gatos, CA)

- Meta Software Corporation, Cambridge, MA

- Oracle Corporation, Bethesda, MD

- Wizdom Systems, Inc., Alexandria, VA

- @Home, Redwood City, CA

The Koop Foundation, Inc., has ceased operation, an action that was not related to the ATP-funded joint venture. Other participants in the joint venture are able to revive the research if they chose to do so.

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