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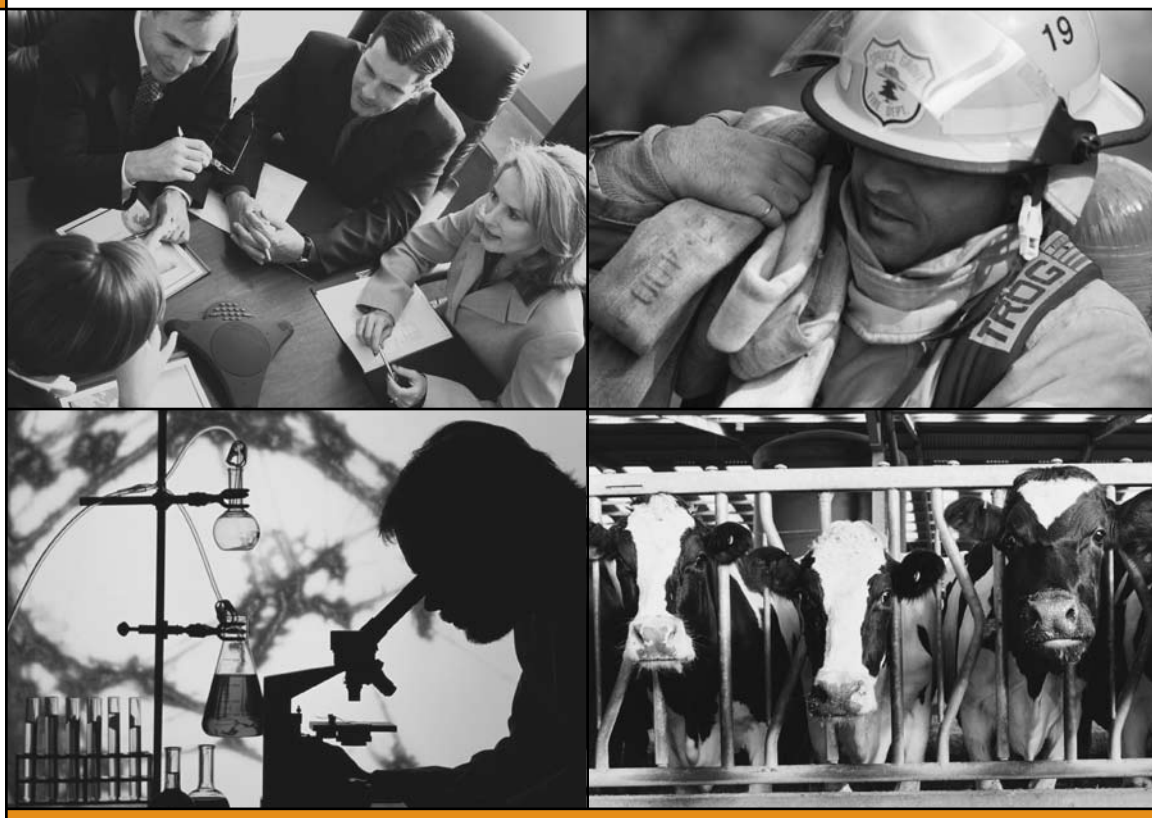
The E-Government Collaboration Challenge: Lessons from Five Case Studies



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IBM Center for
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Networks and Partnerships Series

NETWORKS AND PARTNERSHIPS SERIES

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FOREWORD

On behalf of the IBM Center for The Business of Government, we are pleased to present this report, "The E-Government Collaboration Challenge: Lessons from Five Case Studies," by Jane Fedorowicz, Janis L. Gogan, and Christine B. Williams.


Albert Morales

Increasingly, the major challenges facing the nation will require cross-organizational collaboration among public, private, and nonprofit organizations. And oftentimes, this collaboration will involve the use of information technology to make such collaborative efforts work. This report examines five diverse case studies in which collaboration depended on the effective use of information technology.

The authors assess the political, administrative, and technical challenges that occurred in each of these five case studies and find commonalities across the cases in both the challenges faced and lessons learned. They conclude, "Interestingly, the technical challenges tended to be the least difficult to surmount...."


Glenn Galfond

Based on the lessons learned from these case studies, the authors offer 10 recommendations to ease the way for future cross-organizational initiatives that require using a common information technology system as the backbone of the collaborative effort.

We hope that the lessons learned from the case studies in this report, and the resulting recommendations, will help public managers across government to avoid the pitfalls faced by the executives in these five cases. By learning from the experience of others, managers can use this information to increase their successes in future information-technology-supported collaborations that they might undertake.

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EXECUTIVE SUMMARY

Governments at all levels are increasingly turning to cross-organizational collaboration to achieve joint outcomes, and information technology is an important enabler for shared data and processes. This report examines five cases of e-government collaboration:

- California Franchise Tax Board: Integrated Nonfiler Compliance Program
- U.S. Treasury: Internet Payment Platform
- Capital Wireless Integrated Network
- U.S. Centers for Disease Control and Prevention: Bioterror/Rapid Syndromic Surveillance Initiative, "BioSense"
- Wisconsin Livestock Identification Consortium

These cases provide a wide variety of collaborative efforts between agencies, levels of government, and public-private sectors.

The report finds that public managers face similar challenges in using a common technology platform—such as the Internet or compatible radio frequencies—to drive and enable collaboration, and that there are common lessons learned and recommendations for others who may want to attempt similar efforts.

The case studies examined political, administrative, and technical challenges, and the authors conclude with recommendations for public managers interested in using technology to both drive and enable interorganizational collaboration. The recommendations are summarized below:

1. Create opportunities for collaboration out of crises and other precipitating events.
2. Establish a shared understanding of goals and objectives.
3. Cultivate a team of champions.
4. Assess readiness and facilitate participation in the collaboration.
5. Leverage opportunities to combine data from multiple sources within the boundaries of social expectations.
6. Develop a business model for long-term viability.
7. Understand—in detail!—how data are to be exchanged and used.
8. Consider leading-edge technologies, but accept the legacy reality.
9. Solicit many informed opinions on what software tools to use, and choose them carefully.
10. Adhere to standards and, if possible, help set them.

Introduction

Private sector organizations have made great strides in using interorganizational systems to improve their ability to collaborate with business partners. As citizens become accustomed to fewer out-of-stock items at the supermarket, speedier fulfillment of online orders, and more responsive customer service, they assume government will be equally responsive. They expect government agencies to run efficiently and to use the Internet and a variety of information technology (IT) applications and tools to improve public services and public safety.

Answering this call, federal, state, and local government agencies in recent years have made significant investments in IT for cross-jurisdictional and cross-functional collaboration. Some initiatives involve information sharing across multiple agencies, while others involve IT-supported collaboration among both government and business entities. For example, federal and state governments and the grocery and banking industries combined forces in the Electronic Food Stamp initiative.

For every successful initiative, there unfortunately have been many failed attempts, thanks to a variety of complex political, administrative, and technical challenges. This report offers guidance to avoid the pitfalls and increase the likelihood that IT-supported collaborations will succeed.

The report examines five cases of IT-enabled interagency collaboration:

- Two examples involving collaboration among government agencies:
  - California Franchise Tax Board
  - Capital Wireless Integrated Network

Acronyms and Abbreviations

AIN	15-digit animal identification number
BEP	Bureau of Engraving and Printing
BioSense	Bioterror/Rapid Syndromic Surveillance Initiative
BSE	Bovine Spongiform Encephalopathy ("mad cow" disease)
CapWIN	Capital Wireless Integrated Network
CDC	Centers for Disease Control and Prevention
CFTB	California Franchise Tax Board
DoD	Department of Defense
EMS	Emergency Medical Services
FMS	U.S. Treasury's Financial Management Service
GIN	13-character group/lot animal identification number
HIPAA	Health Insurance Portability and Accountability Act
INC	Integrated Nonfiler Compliance Program
IPP	Internet Payment Platform
IT	information technology
NAIS	National Animal Identification System
NEDSS	National Electronic Disease Surveillance System
RFID	radio frequency identification
SARS	Severe Acute Respiratory Syndrome
USDA	U.S. Department of Agriculture
VA	Department of Veterans Affairs
WLIC	Wisconsin Livestock Identification Consortium

- Three examples involving collaboration among government agencies and private sector businesses:
  - U.S. Treasury's Internet Payment Platform
  - Centers for Disease Control and Prevention's BioSense Initiative
  - Wisconsin Livestock Identification Consortium

We assess three sets of challenges that all five cases faced: political, administrative, and technical. We observed that these challenges are not experienced in isolation; rather, they interact and need to be managed in tandem. Interestingly, the technical challenges tended to be the least difficult to surmount, especially when related political and administrative issues were identified and addressed. The report offers a set of lessons learned and recommendations for leaders attempting to support similar interorganizational collaboration initiatives.

Five Case Studies of E-Government Collaboration

We examined five case studies of cross-organizational collaboration involving the use of a common IT platform to support the collaborative effort:

1. California Franchise Tax Board (CFTB): Integrated Nonfiler Compliance (INC) Program
2. U.S. Treasury: Internet Payment Platform (IPP)
3. Capital Wireless Integrated Network (CapWIN)
4. Centers for Disease Control and Prevention (CDC): Bioterror/Rapid Syndromic Surveillance Initiative, "BioSense"
5. Wisconsin Livestock Identification Consortium (WLIC)

In each example, public sector organizations identified a common problem and came together to design and implement a solution through collaboration and data sharing using an IT platform. Table 1 on page 10 summarizes key characteristics of each case.

These five case studies represent a range of collaborations:

- Different combinations of public and private sector collaboration
- Different governance models (i.e., a third-party consortium versus control by an initiating public sector participant)
- Different cross-jurisdictional boundary spanning (i.e., by level—federal, state, local—by jurisdiction, or by agency function)

For each initiative, a public record is available on a website, in planning documents, or in annual reports that identifies participants and tracks progress toward project goals. Each collaborator formalized its infrastructure, governance, and relationships through contracts, formalized agreements, and/or memoranda of understanding. This record, plus secondary source material, revealed how political, administrative, and technical issues affected such aspects as project governance, data replication, data standards, and process redesign. The Appendix presents the framework that guided the analysis. We examined elements that impeded or supported collaborative success, from the viewpoint of the individual participating organizations and at the project level.

For each case, we conducted two or more interviews (face to face or via telephone) to gain information on stakeholder perspectives, to verify the accuracy and completeness of facts gleaned from secondary sources, and to get an update on the current status of each initiative.

We begin with a brief discussion of the context and impetus for each initiative, pertinent details of the collaborating organizations, the systems and processes that were designed or redesigned, and the current status of each initiative.

Case Study 1: California Franchise Tax Board's Integrated Nonfiler Compliance Program

Like many other states, California faces a large budget deficit. The governor's budget for fiscal year 2005–06 anticipated spending $90.0 billion from the General Fund, covered by $84.3 billion in General Fund revenues. The shortfall must be covered by either a reduction in spending, higher than expected revenues, or borrowing.[1] The California Franchise Tax

Table 1: Summary of the Five Case Studies

	California Franchise Tax Board's INC Program	U.S. Treasury's Internet Payment Platform	Capital Wireless Integrated Network	U.S. Centers for Disease Control and Prevention's BioSense	Wisconsin Livestock Identification Consortium
Focus/Goal	Identify people who underreport income	Streamline procurement and payment processes	Improve first-responder effectiveness	Identify and respond to bioterror or disease outbreaks	Track infected and potentially infected livestock
Collaborators	City, county, and federal state agencies	Federal agencies and private sector vendors	City, county, state, and federal agencies	City, county, state, and federal agencies, and private sector businesses	State agencies, private sector businesses, and industry associations
Functions	Tax administration, licensing boards	Procurement, accounting	Police, fire, EMS, park services, transportation	Hospitals, laboratories, public health	Farmers, hobbyists, public health, USDA
Governance	Central control by state agency	Central control by federal agency	Consortium; compact not yet ratified	Central control by federal agency	Consortium of business and government leaders
Project stage	Fully operational	Time-bound pilot test	In rollout	Early in rollout	Early in rollout
Timeliness of data exchange	Monthly/annual sharing	Weekly sharing	Real time	Daily	Daily

Board (CFTB) estimates that the state's tax gap (difference between the amount of taxes paid and the amount of taxes that should be collected) is $6.5 billion, or one-eighth of total personal and corporate income tax revenues. This amounts to 8 percent of the General Fund.[2] The tax gap results from underreported income, failure to file tax returns, and underpayment of taxes. Collection of these taxes would help eliminate the budget deficit and send a message of fair taxation to taxpayers.

The CFTB is one of three agencies in the state charged with tax administration. The board handles personal and corporate income taxes on behalf of the state. In addition to tax collection, the CFTB is responsible for several non-tax programs such as child support debt collections. The board is organized around three primary business functions related to tax filing, auditing, and accounts receivable management. Filing enforcement is handled through the Filing Compliance Bureau, which also handles some income withholding at source programs. The 120-person department sent out 615,000 nonfiler notices for tax year 2003 and approximately 750,000 notices for tax year 2004. Notices are not sent until after the extended due date for the return. The CFTB receives about 250,000 tax returns as a result of this mailing. Filing enforcement annually brings in nearly $500 million in revenue.

Individuals who have been identified as likely to have a requirement to file an income tax return but have not done so are sent the nonfiler notice, which requests the individual to either file a tax return or respond back explaining why tax isn't owed. If neither is received, the nonfiler will be sent a notice of proposed assessment, which includes an estimate of the amount of taxes owed based on information that indicates that the person either has been doing business in California or earning income in California.

The success of the recent filing enforcement effort can be attributed in large part to the department's Integrated Nonfiler Compliance (INC) program, which utilizes a sophisticated data warehouse containing income and income indicator information on individuals who have not filed income tax returns in the state. It collects data from a variety of federal, state, county, and local sources to provide leads about the existence of nonfilers and estimates of the amount of taxes they may owe. Nonfilers are discovered when INC data are matched against accounts receivable data to see if a taxpayer has filed a tax return and if all known or imputed income has been reported. In addition to identifying nonfilers, the INC system helps to provide better customer service and communication and to reduce the number of unnecessary taxpayer contacts.

The INC system was first used in 2001 for 1999 taxes. Annually it collects approximately 220 million income records from a variety of sources, including banks, the Internal Revenue Service, and state and local agencies. The INC system is used primarily by the Filing Compliance Bureau to identify nonfilers to be notified. However, the Collection (Accounts Receivable Management) Division also can use it to look up information on taxpayers whose case goes into the collection cycle, and the Audit Division uses the system to verify that a taxpayer is reporting all the income information about him or her contained in the system.

The data warehouse contains listings from the U.S. Internal Revenue Service of all taxpayers who filed a federal return using a California address, as well as IRS Form 1099 income data such as interest, dividends, stock sales, real property sales, and retirement income. Another California tax agency, the Employment Development Department, contributes a list of wage earners from its wage and wage withholding data. Indirect income indicators come from other sources. A top indirect indicator is the IRS Form 1098, which reports mortgage interest paid. Forty-nine state licensing boards also contribute lists of occupational license holders, such as real estate agents, barbers, cosmetologists, doctors, and attorneys. Other reported data reflect partnership returns and lists of self-employed individuals who either employ other individuals or hold a resale license.

Other data sources under consideration include property tax data (to check against reported income), the kinds of cars people drive, alcoholic beverage control licensing information, motor fuel tax filings to identify self-employed truckers, day care and residential care license holders, city business taxes, and third party check cashing information. The bureau is considering the trade-off between the technical and political costs and challenges of integrating these additional sources and the additional value each contributes before deciding whether to proceed with each data source.

Case Study 2: U.S. Treasury's Internet Payment Platform

In recent years, federal agencies have made significant investments in information technologies and applications aimed at reducing costs and improving operational effectiveness. Some of these efforts, prompted by government regulations and mandates, involve exchanging information across organizational boundaries, functional areas, or jurisdictions in support of shared business processes. At the federal level, many directives governing typical purchasing activities have spurred increased interest in e-procurement and e-payment systems. These include congressional legislation such as the 1982 Prompt Payment Act, which requires payment within 30 days of either receipt of a proper invoice or acceptance of the goods or services, and George W. Bush's President's Management Agenda, which mandates "expanded electronic government." In addition, the Government Paperwork Elimination Act of 1998 requires substituting electronic for paper information and accepting electronic signatures.

Mandates are not the only driver; some agencies were motivated to pursue electronic purchasing by unexpected challenges. For example, in fall 2001, a series of anthrax attacks in Washington, D.C. precipitated a decision to route all paper mail through an irradiation facility before delivery to federal offices. This causes about a week's delay in delivery of paper mail, and the irradiation process has a tendency to melt plastic envelope windows and cause paper to become brittle and crumbly. In at least one federal agency, accounting clerks expressed great frustration over handling irradiated paper, so that the paper-elimination promise of an electronic invoice provided an unexpected motivation for them to support electronic payment processing. Their suppliers were also enthusiastic about e-payments because invoices were no longer delayed in transit.

The Internet Payment Platform (IPP) collaboration was one of several Payment Application Modernization projects sponsored by the Financial Management Service of the U.S. Treasury.[3] Planning for a pilot test of IPP began in spring 2002. The pilot eventually included participation of three governmental agencies: the Bureau of Engraving and Printing, the Denali Commission, and the U.S. Department of Labor. Additional participants included the Federal Reserve Bank of Boston and several software vendors.

IPP supported federal agencies' payments to their vendors, using a customized version of a commercial service sold by Xign, Inc. The system translated data from participating organizations' back-end accounting systems into XML using an "enterprise adapter" run on a server located at Treasury. The Federal Reserve Bank of Boston, acting on behalf of Treasury, managed the payment processing during the pilot test.

Using this web-based system, government agencies would send electronic purchase orders to suppliers who (after providing the goods or services) converted (or "flipped") those purchase orders into invoices and subsequently paid the invoices electronically. Payees and payers could view data, manage the workflow associated with that data, verify the identity and authenticity of users and accounts, settle credit transactions through the Automated Clearing House (ACH), and provide robust reporting. A key design factor was a database that continually received and aggregated data throughout the life cycle, becoming the hub to the entire transaction exchange.[4,5]

The Bureau of Engraving and Printing (BEP), the arm of the U.S. Treasury that produces U.S. currency, was the first agency to participate in the IPP pilot. It issued its first payment via IPP in spring 2003, and the first successful purchase order "flip" to an invoice followed in July.

Once the two participating BEP suppliers gave IPP favorable reviews, the agency brought on additional suppliers. In fall 2003, 25 suppliers used the IPP, although the first two suppliers accounted for the majority of the transactions processed through it. At this point, the project was ready to add more agencies, and Treasury successfully recruited the Denali Commission, a small federal-state agency that provides critical Alaskan utilities, infrastructure, and economic support. The third and final agency participant to join was the U.S. Department of Labor, whose decision to participate in December 2003 prompted a six-month extension of the pilot through June 2004.

In summer 2006, Treasury announced a new project to modify the IPP software and roll it out to 11 federal agencies. All three agencies who participated in the first pilot signed on for the next one, indicating that the IPP pilot test was successful in forging an ongoing partnership.

Case Study 3: Capital Wireless Integrated Network

In November 1998, a despondent man threatened for several hours to jump off the Woodrow Wilson Bridge, leading to massive gridlock in the surrounding Washington, D.C. metropolitan area. Officers from the District of Columbia, Virginia, and Maryland, the three jurisdictions the bridge spans, operated with different communication devices, which hampered their ability to coordinate and resolve the situation. Lack of interoperability among first responders had been apparent in other natural and man-made disasters over the years. For example, in January 1982, an Air Florida plane crash, combined with a major snowstorm and subway derailment, brought traffic in the Capital area to a standstill.

It was the Woodrow Wilson Bridge incident, however, that prompted the Maryland and Virginia transportation departments to partner with the University of Maryland's Center for Advanced Transportation Technology to design an integrated first-responder network known as the Capital Wireless Integrated Network, or CapWIN. In 2006, the initiative was renamed the Capital Wireless Information Net to better reflect its dual purposes of communications interoperability and information sharing. The interviews for this report were conducted prior to CapWIN's name change to Capital Wireless Information Net. The original name was retained for this report to be consistent with the wording used by CapWIN during the period of the research.

The CapWIN first-responder network is a partnership among the states of Maryland and Virginia, the

District of Columbia, and the federal government (U.S. Department of Transportation and U.S. Department of Justice) to develop an integrated transportation and criminal justice information wireless network.

Following the September 11, 2001, terrorist attacks on the World Trade Center and the Pentagon, interest in the CapWIN project intensified. For example, in July 2004, both the U.S. Senate and House of Representatives introduced legislation (S2701 and HR4930) to improve the sharing of homeland security information among first responders and all levels of government. Announcing the legislation, Senator Joe Lieberman noted: "Three years after the September 11th attacks, too many first responders still lack the basic ability to talk to one another during emergencies…. And key federal agencies still are not effectively sharing homeland security information among themselves, much less with state and local officials." This legislation, as well as the Intelligence Reform and Terrorism Prevention Act enacted in December 2004,[6] reflects the post-9/11 consensus that first responders need interoperable devices and networks to communicate across jurisdictional and functional boundaries.

During the initial conceptual development, the idea was to take advantage of previous efforts to equip first responders, mainly law enforcement, with state-of-the art mobile communications and computing equipment in their vehicles; this was referred to as the "clean cockpit" concept. Planning sessions with representatives from various constituencies, including transportation, police, fire, emergency medical services (EMS), and others, suggested that the project should shift its focus to issues related to data sharing and communications interoperability instead of the vehicle equipment. At full implementation, CapWIN will integrate transportation and public safety data and voice communication systems, and will be the first multistate transportation and public safety integrated wireless network in the United States.

Planning for the deployment of a pilot project for mobile in-vehicle systems began in June 2000; IBM was the lead technical vendor on the project. CapWIN conducted its first training session for beta test users in November 2003. Since then, many live tests of the system have been conducted for planned events such as the dedication of the Washington, D.C. World War II Memorial in summer 2004, the Army Ten-Miler Marathon in fall 2004, and the 2005 September 11th Memorial. While the CapWIN system assisted at 48 such planned events in 2005, 75 percent of total usage happened at 139 unplanned fire/EMS, law enforcement, and traffic incidents.[7] The greatest usage (98 unplanned events) supported traffic incidents, and the most active users were the Maryland State Police and the Maryland Transportation Authority Police. As of December 2005, CapWIN had trained and enrolled 41 agencies and 947 users. Of these, 24 agencies were using the system in December, with 287 participating users. Law enforcement had logged over 25,500 queries. While these usage data suggest that the collaboration is moving into an operational phase, it is likely that the CapWIN collaboration has not yet reached a true tipping point, because a critical mass of active users across jurisdictions and functions has yet to be achieved.

Case Study 4: CDC's BioSense: Real-Time Syndromic Surveillance

In 1993 a waterborne parasitic infection in Milwaukee sickened 400,000 and killed 100 people.[8] This event sparked several early detection initiatives in that region. Subsequently, a comprehensive national solution was proposed, and in 1996 the U.S. Centers for Disease Control and Prevention (CDC) formed a Health Information and Surveillance Systems Board, with broad representation from state and regional public health agencies. The Internet-based Health Alert Network began in 1999, followed by work on a National Electronic Disease Surveillance System (NEDSS). Its goals were to better manage and enhance the large number of current surveillance systems and allow the public health community to respond more quickly to public health threats. When complete, NEDSS will electronically integrate and link together a wide variety of surveillance activities and will facilitate more accurate and timely reporting of disease information to CDC and state and local health departments. NEDSS will include data standards, an Internet-based communications infrastructure built on industry standards, and policy-level agreements on data access, sharing, burden reduction, and protection of confidentiality.[9]

In contrast to traditional public health surveillance, "syndromic" surveillance aims to "identify illness clusters early, before diagnoses are confirmed and reported to public health agencies, and to mobilize a rapid response…."[10] According to CDC Director Dr. Julie Gerberding, the post-9/11 anthrax attacks in fall 2001 highlighted a flaw in the Center's procedures, which emphasized data accuracy and completeness at the expense of timeliness. The anthrax attacks, combined with criticism of CDC's problematic response to them, helped propel forward the Health Alert Network, the NEDSS, and several syndromic surveillance initiatives, including BioSense, all under the umbrella of the CDC's Public Health Information Network (PHIN) initiatives. As can be seen in Table 2, NEDSS is responsible for routine surveillance (primarily the notifiable disease program), and BioSense aims to "enhance early detection, quantification, and localization of possible bioterrorism attacks and naturally occurring events and to help develop a real-time national surveillance infrastructure."[11]

As initially envisioned in 2002, BioSense was to be an early detection tool for bioterror attacks; the idea was to quickly identify clusters of patients with symptoms related to known biological agents in 11 syndrome groups (fever, respiratory, gastrointestinal, lymphadenitis, specific infection, localized cutaneous lesion, rash, neurologic, botulism-like illness, hemorrhagic illness, and severe illness or death). To do this quickly, it was felt that pre-diagnostic data such as chief complaints (the primary symptom or symptoms a patient describes upon arrival at an emergency room or clinic) and laboratory orders (which reveal what the doctor is looking for) would provide the earliest indicators of an outbreak or attack. These data already were being captured and stored in electronic form at many hospitals and clinics. The BioSense software system provided tools to aggregate data from multiple locations and to perform various statistical analyses (in comparison with historical data) that would help to identify abnormal clusters of chief-complaints symptoms, lab orders, and other indicators.

While the initial intent was to detect bioterror attacks, participants soon came to appreciate the potential value of this interorganizational system for detecting or confirming naturally occurring outbreaks, such as Severe Acute Respiratory Syndrome (SARS), West Nile virus, or avian flu. Today, BioSense has a broader public health goal and includes influenza and other disease syndromes. Current participants include Department of Defense (DoD) hospital emergency rooms and clinics, 172 Veterans Affairs (VA) emergency departments, 650 VA clinics, 31 LabCorp testing locations, and 1,110 LabCorp patient service centers. Phase I pilot testing began in 2004, and as of July 2005 there were 400 users enrolled, from 49 states and 34 cities.[13] As of fall 2005, BioSense was capturing and analyzing data from four main sources: DoD, VA, LabCorp, and BioWatch.

BioSense provides "near real-time" analysis, by which data are extracted from various sources, translated into a common format, and uploaded into a data warehouse once a day. An analytical cube is built once a week, more often if circumstances warrant. Early experiences with the system show that rapid analysis of BioSense data is unlikely to reveal the *first* known instance of an outbreak. However, once an outbreak or attack is suspected, BioSense is useful for revealing geographic clusters

Table 2: BioSense in its Broader Context[12]

Early event detection	BioSense	**Public Health Information Network (PHIN)**
Outbreak management	Outbreak management system	
Surveillance	National Electronic Disease Surveillance System	
Secure communications	Epidemic Information Exchange	
Analysis and interpretation	BioIntelligence analytic technology	
Information dissemination	CDC Internet health alerting	
Public health response	Countermeasure administration (lab tests, vaccines, etc.)	

of diseases or symptoms, or for establishing that an apparent cluster is not cause for concern. For this reason, the BioSense architecture is designed to spot geographic and time trends in the data rather than to reveal nuances of individual patient data. Since each data set is imperfect, multiple indicators are needed. Additional data sources (beyond chief complaints and lab orders) are under consideration as the BioSense initiative moves forward, including over-the-counter drug sales, poison control centers, nursing hotlines, insurance claims clearinghouses, patient electronic records from hospitals and health plans, and health information systems vendors.

Case Study 5: Wisconsin Livestock Identification Consortium

In the past, U.S. animals were individually identified as part of official animal disease eradication programs such as vaccination against brucellosis in the 1930s, '40s, and '50s. When that disease was essentially eliminated in the 1960s, states began to withdraw this requirement, which meant that they also lost the ability to trace herds.

In 1995, a heifer infected with tuberculosis crossed into Wisconsin from Michigan and commingled with other heifers that were part of a multiple ovulation embryo program. This unfortunate event resulted in the shutdown of one of only two bovine breeding programs in the world, at a cost of $1 million to the company, 21st Century Genetics. It took a long time to track the infected animal because intrastate movements of animals were not regulated; there was no system to identify where an animal came from, where it had been, and those that had come in contact with it. The former general manager of 21st Century Genetics initiated talks with a small number of influential people in Wisconsin agriculture to explore various options for rapid tracking of Wisconsin farm animals.

In February 2001, British papers reported that one million domestic animals had been slaughtered as a result of an outbreak of foot-and-mouth disease. Fearing that this disease would spread to North America, in 2002 a group of farmers established the Wisconsin Livestock Identification Consortium with start-up funds from the state. The European outbreak of Bovine Spongiform Encephalopathy (BSE, or "mad cow" disease) in 2002 added fuel to the fire and spurred the U.S. Department of Agriculture (USDA) to establish a National Animal Identification System, or NAIS. USDA's ultimate goal is an effective, uniform national animal tracking system to help maintain the health of U.S. herds and flocks. When fully operational, it will allow animal tracing within 48 hours of detection of disease in a participating animal, and thereby ensure rapid containment and maximum protection of American animals.[14] The Wisconsin consortium developed the system that was adopted by the USDA.

The Wisconsin Livestock Identification Consortium (WLIC) is a multi-species effort led by Wisconsin's livestock and industry organizations in cooperation with the Wisconsin Department of Agriculture, Trade and Consumer Protection; the USDA; and the University of Wisconsin Extension. As of March 2005, 58 livestock industry groups had joined WLIC and were working to implement the National Animal Identification System in Wisconsin. They elect a board of directors whose 12 members actively participate in the consortium through quarterly and annual meetings, various committees, and hands-on pilot projects. The board establishes objectives and governing policies.[15]

Implementation of the NAIS, which Wisconsin is following, entails three major steps. The first is premises identification, which involves identifying locations that produce, house, hold, or manage animals using a unique seven-character national identifier. The rules and regulations, data collection, and storage attached to premises registration are under the authority of each state's Department of Agriculture. The second step (not yet implemented in Wisconsin) will be animal identification, which will require either a 15-digit unique individual animal identification number (AIN), or a 13-character group/lot identification number (GIN). Producers desiring individual identification will obtain an official identification device, such as radio frequency identification (RFID) ear tags, from a distributor, who then will forward a record of AINs allocated to the premises to the state or national animal identification database. The third step (also not yet implemented) will be animal tracking through a one number/one animal system that will use the AIN or GIN. This will be read by stationary electronic readers as animals move through livestock markets and slaughter facilities. Producers may elect to

obtain equipment to read the ID tags of animals moving from farm to farm; buyers of animals not recorded through any regulatory processes will need to report these movements to the state or national database. USDA expects mandatory premises registration and animal identification in the National Animal Identification System by January 2008 and mandatory reporting of animal movements by January 2009.[16]

The Wisconsin Premises Registration Act (Wisconsin Act 229), effective November 2005, requires registration with the Department of Agriculture, Trade and Consumer Protection for any location where livestock congregate.[17] Voluntary registration by anyone who keeps, houses, or commingles livestock is mandatory in Wisconsin as of January 1, 2006.[18] The Wisconsin Livestock Identification Consortium administers premises identification in the state as an agent of the Wisconsin Department of Agriculture, Trade and Consumer Protection, which retains authority for compliance and prosecution of violators, who face a $1,000 penalty per instance. The information is kept in a confidential database accessible to animal health officials.

As of February 2006, more than 45,000 premises of the estimated 60,000–70,000 livestock premises in the state had been registered.[19] Wisconsin is an early adopter of the NAIS standards and procedures; its registrations represent nearly 25 percent of the 180,000 premises registered nationwide at the end of November 2005. In a May 5, 2005, press release, Rod Nilsestuen, Wisconsin's Secretary of Agriculture, Trade and Consumer Protection, stated: "Wisconsin set the example for the nation when it came to premises registration and now we're setting the pace, too."[20]

Three Sets of Challenges to Collaborating via Common Technology

The case studies we examined revealed three sets of challenges that interagency collaboration initiatives face when using technology to support the collaborative effort. These are summarized in Table 3. The cases we studied addressed these challenges in a variety of ways with varying outcomes, and yield several important lessons learned.

Political Challenges

In most collaborative ventures, the greatest challenges are often rooted in the tug and pull of interorganizational politics. These arise not from partisan politics, but from the tendencies of agencies to compete rather than collaborate. These dynamics are often driven by the larger environment in which a collaborative venture is operating—often with a unique combination of circumstances. We found this to be true in each of the five case studies. However, these cases also pointed out ways to overcome this first set of challenges. We highlight here three types of political challenges: challenges from the external environment, the imperative of crafting shared goals, and the importance of sustaining long-term support from key stakeholders.

P1. Challenges from the External Environment: What Are the Catalysts and Constraints That Inspire the Effort?

We focus on two types of external challenges: catalysts and constraints. A *catalyst* is an event or situation that captures stakeholders' attention and helps to propel an initiative forward. A *constraint* is an

Table 3: Three Sets of Challenges to Collaborating via Common Technology

Political Challenges		
P1	The External Environment	*What are the catalysts and constraints that inspire the effort?*
P2	Shared Goals	*How does the project team meet varied expectations?*
P3	Getting and Keeping Support	*What roles do champions play?*
Administrative Challenges		
A1	Governance	*How does the leadership group exercise—and agency participants delegate—control over the collaboration?*
A2	Implementation	*What is needed to make it work?*
A3	Financing	*How can a viable business plan be achieved?*
Technical Challenges		
T1	Data	*How are data shared effectively?*
T2	Legacy Systems	*Where are the technical roadblocks?*
T3	Standards and Sourcing	*How can the system best employ available building blocks?*

event or situation that can impede progress or provide useful structure; its impact can be positive, negative, or neutral.

In the public sector, legal and regulatory requirements can serve as catalysts, propelling interagency integration initiatives forward, or as constraints, affecting design and use of an interagency system or impeding the progress of the collaboration.

We observed several examples of legal/regulatory catalysts. For example, the President's Management Agenda and the Prompt Payment Act served as a catalyst by giving federal agencies incentives to participate in the Internet Payment Platform pilot. Federal legislation such as the Intelligence Reform and Terrorism Prevention Act helped CapWIN receive funding, while the Wisconsin initiative benefited from its positioning within the federal National Animal Identification System, which set a target of mandatory premises registration by 2008 and mandatory animal movement reporting by 2009.

The absence of a regulatory mandate can serve as a constraint on an interagency initiative. For example, the animal identification initiative has been deterred by the current USDA's neutral stance regarding ID tagging equipment, which has led many stakeholders to fear that tagging systems will not be interchangeable across herds, species, and states. In contrast, the BioSense initiative benefited from prior standards- and policy-setting efforts. For example, under the Health Insurance Portability and Accountability Act (HIPAA), local healthcare providers and local and state public health officials work with clear guidelines that allow them controlled access to patient-identified data (to track down a tuberculosis or syphilis patient and all his or her contacts, for example). However, at the federal level this is not permitted (so, for example, an employee at the CDC does not have access to individually identified patient information). The BioSense initiative benefited from the clarity provided in these rules.

State and local laws and regulations add another layer of mandates that can spur or constrain interorganizational collaboration. The Wisconsin Premises Registration Act of 2004 gave the WLIC initiative momentum and won accolades for the state as a pace-setter in animal identification. CapWIN, on the other hand, became bogged down in the process of gaining state and local approvals (Virginia, Maryland, and Washington, D.C.) for contracts and funding authorizations. California's Franchise Tax Board must adhere to California Revenue and Tax Code 19504, which prohibits the use of "economic reality" audit techniques to find unreported income and permits only those where "probable cause" for tax evasion can be demonstrated. The director of the Filing Compliance Bureau succinctly summarized how this law limits the use of the INC system to locate nonfilers:

> We just can't say because you are driving a Ferrari and because you live in 90210 Beverly Hills we're going to audit you even if your tax return shows a low amount of income.

While legal or regulatory developments are highly visible catalysts or constraints, other developments also can affect interagency initiatives. Sometimes the connection between a galvanizing event and the cross-boundary initiative is less visible. For example, the Wisconsin livestock identification initiative was first championed by a politically well-connected figure after his company's breeding business sustained a $1 million loss from a tuberculosis-infected heifer that commingled with his bulls. While his company's calamity was a sufficient catalyst to bring some participants on board, it was not enough to yield a critical mass of participants to rally around the WLIC initiative. Subsequently, other events led people to recognize the larger threat. The 2001 outbreak of foot-and-mouth disease in Europe captured the attention of many key stakeholders, as did the December 2003 report of the first U.S. case of mad cow disease. A WLIC leader emphasized how the foot-and-mouth and mad cow outbreaks motivated policy makers at the state and national levels:

> We all understood that in order to get a mandatory program, we had to have a crisis. It just happened that as we were tooling up, we got the crisis…. If we had not had that, the USDA would not have put it on their radar....

Yet, there is more to this story since many states have not yet moved to implement an animal identification program. Clearly, a crisis can have a galvanizing impact in one context but not all. Strong

leadership made the difference in Wisconsin and the other states that have moved forward on animal identification. Consider also CapWIN, which received its initial funding following a massive traffic snarl caused by a bridge jumper. It was the joint leadership of department of transportation managers from two different jurisdictions that made the difference here. Strong leaders were needed to interpret events and articulate a clear and persuasive case for action.

It is also important to note that on a single night in 1982, the Washington Capital area experienced three disasters in combination (airliner crash, debilitating snowstorm, subway derailment). Those events did not propel changes in first-responder communications networks at the time, even though their impact was far more severe than the traffic jam caused by the 1998 bridge jumper. Our study reveals that CapWIN's leaders reminded their audiences of the triple 1982 disaster when they presented their proposed new first-responder network. These spokesmen had been on the scene in 1982, and they had not forgotten the difficulties they had experienced due to interoperability issues. Their comments suggest to us that some leaders became better attuned to the galvanizing potential of crises as a result of having gained relevant experience in previous events or projects.

These cases also reveal that prior working relationships forged in response to earlier crises or during prior initiatives can help set the stage for future collaboration. For example, the BioSense initiative built upon earlier work to set or adapt to healthcare data coding standards (such as HL7) and regulations (such as HIPAA), as well as earlier syndromic surveillance initiatives, such as the Health Alert Network, sponsored by the CDC. In the aftermath of the fall 2001 anthrax attacks (and subsequently the start of the Iraq War), conditions were ripe for the new CDC director, Dr. Gerberding, to step in with a compelling call to action. The animal identification initiative also built on previous work that brought together principal dairy industry players from the Wisconsin Federation of Cooperatives, the Farm Bureau, and state veterinarians. Tom Lyons, the "father" of the WLIC initiative, was himself plugged into many key stakeholder groups by virtue of his previous roles as general manager of a high-tech breeding company, CEO of a 60,000-member co-op, chair of the Board of Regents of the University of Wisconsin, and other significant roles. And Treasury's IPP project manager, Brett Smith, had previously worked with managers at the Bureau of Engraving and Printing, the Federal Reserve Bank of Boston, and several IT vendors on previous payment application modernization projects.

Over time, a collaborative project can experience one catalyst or several. A few years into the CapWIN initiative, the 9/11 terrorist attacks prompted a key leader to articulate a new push for action, which helped stakeholders see that CapWIN's reach could extend far beyond traffic control. This reinvigorated the project and produced a major infusion of funding.

Initiatives also can be precipitated by the perceived threat of a crisis rather than by an actual public disaster. For example, the California Franchise Tax Board's INC project developed against the backdrop of the state's large and worsening budget deficit. And the Internet Payment Platform pilot test was prompted by the advent of various new forms of Internet-based electronic money and the perceived threat that the Federal Reserve Bank, U.S. Treasury, and commercial banks could be adversely affected if non-traditional payment mechanisms (especially non-bank payments) were to catch on. This prompted the Treasury to establish the Financial Management Services "eMoney" organizational unit (an internal R&D group) to investigate new payment mechanisms. With this structure in place, leaders were able to obtain resources for the IPP pilot test.

Lessons Learned

Legislative and regulatory requirements can act as catalysts by establishing goals, setting timetables, or providing a framework to mediate disputes around competing interests and approaches. Or they can impose constraints on system design, policy decisions, or operational procedures. When an interagency collaboration spans multiple jurisdictions, functions, or disciplines, requirements may be contradictory and will compete for time, attention, and resources. Project leaders should shape and leverage regulations where they can, and keep close track of those that could impede or delay progress. There are simply more of these *i*'s to dot and *t*'s to cross in interorganizational projects.

Some interagency initiatives came about or were propelled forward in response to specific events while others were initiated in anticipation of a crisis or regulatory change. But compelling events do not necessarily succeed in getting states to launch interagency initiatives; in fact, some extremely compelling events did not have a galvanizing effect, even in the most affected communities. Effective leaders do not wait for a crisis before they issue their call to action. Instead, they connect the dots of evidence to show affected stakeholders the importance of a proposed interagency solution.

P2. The Challenge of Shared Goals: How Does the Project Team Meet Varied Expectations?

Two critical tasks are associated with initiating a collaboration: recruiting participants and meeting expectations. To succeed, influential stakeholders must be recruited to the effort, and a critical mass of users must be persuaded to take part. Even when policy or statute mandates participation, compliance may be slow and difficult to impose. Skillful leaders can articulate a persuasive case for action, which helps inspire others to join in. We found that many leaders were surprised at how much time and resources were required for education and outreach activities, and many were disappointed to realize that they had insufficient funds and staff for these purposes.

Some key stakeholders may hold back because of limited resources, insufficient skills, or a lack of staff with the right kind of experience and expertise. We also found that some potential participants expressed concern when they were told they would need to change or duplicate their operational processes as a condition of participation. To the extent possible, the costs of participation in the early stages of a collaboration should be minimized (or broadly shared) to gain the cooperation of key stakeholders.

We observed that the recruitment challenges for the animal identification initiative varied by species group. In Wisconsin, the dairy industry came on board early. Dairy farmers had past experience with infectious disease outbreaks and are accustomed to tagging animals at birth, as well as collecting and recording data about them to improve breeding and herd management. They understand the stakes of a tracking and trace-back system, and moving to a more standardized tracking system that includes some additional key data elements such as premises identification is not a large step. However, individual hobby owners of horses, as well as people who raise rabbits for meat or to show at 4-H fairs, view identification and tracking as an unnecessary burden. The WLIC has invested in an education initiative to explain that while these animals might not contract a disease, they could intermingle with other species and carry infection from place to place, jeopardizing the food supply. If the government were to take strong measures such as terminating indemnity payments for failure to register premises, it would get the attention of those in business, but might not make a difference to hobby farmers. The current $1,000 fine for failing to register livestock premises may set an example if it is enforced.

In attempting to induce higher levels of participation, leaders occasionally oversell their initiatives. However, as new participants sign up, costly new functionality and features may creep into the system design. Effective leaders must carefully assess the balance between the promises they make and the costs they must manage.

The CapWIN leaders envisioned a system that would benefit police, firefighters, and other first responders. An influential fire chief was a strong spokesperson who helped the initiative obtain valuable funding. However, CapWIN's broad scope subsequently had to be narrowed in order to make progress on its complex systems development effort. So, in its first release, CapWIN provided access to criminal justice data, which police valued, but did not provide access to a hazardous materials (hazmat) database, which firefighters wanted (even though early presentations mentioned this anticipated feature). The early decision to get firefighters on board subsequently resulted in frustration and resistance when CapWIN did not give them access to information useful for firefighting. As project costs mounted and new funding sources failed to materialize, dollars that might have been used to implement the desired hazmat functionality were instead allocated to operations and maintenance of the initially deployed law enforcement system. This example illustrates how collaboration leaders sometimes broaden their goals and promise new functionality or features in their attempt to attain critical mass. In doing so, they face the trade-offs inherent in both managing stakeholder expectations and controlling scope creep.

Project managers are often advised to start by "picking the low hanging fruit," that is, rolling out the easiest possible functionality to get an "early win," even if the first release appeals only to a subset of the target population. The CapWIN team made such a choice. Although it was easier to implement the law enforcement functionality first, the CapWIN initiative paid a price later when firefighters became disillusioned and critical of what they felt were unfulfilled promises.

CapWIN and BioSense were designed to support unpredictable and infrequent emergency situations. This gave rise to another aspect of the challenge of managing expectations. When a system is used only intermittently, some users forget how to use it correctly and may not consider using it when the need does arise. To overcome this challenge, the CapWIN leaders arranged for the system to be used for a variety of planned events (such as during Independence Day festivities and the presidential inauguration).

The BioSense leaders decided to expand their project objectives and to add functionality so that participants could reap benefits in their routine operations. Funded initially as a bioterror initiative, BioSense subsequently added coverage of various naturally occurring outbreaks including SARS and West Nile virus. Today BioSense encompasses a broad array of public health concerns including influenza, and the BioSense designers are working to modify the system to include user-defined thresholds. This will enable participating hospitals and public health agencies to establish false-alert settings that are consistent with their local investigation needs and resources. The designers also expect that the statistical tools that are being developed to analyze human syndromes can be applied to other problematic situations, such as outbreaks among animals, incidents of contaminated water, and so on. This would strengthen the bioterror assessment capabilities while offering additional benefits.

BioSense also has shifted focus away from early outbreak identification (identification of the first instance of an outbreak) to "situational awareness," a broader focus that emphasizes confirming whether an outbreak has or has not occurred ("has not occurred" being information that is as valuable to public health decision makers as "has occurred"), and pinpointing where resources are most needed (by homing in on geographic clusters, for example). Taken together, the dual moves—to a broader syndromic scope and to a focus on situational awareness—have helped to ensure wider support for BioSense among participating hospitals and public health agencies.

The animal identification initiative was justified primarily based on the argument that such a system is needed to cope with outbreaks of mad cow or foot-and-mouth disease, which thus far have been quite rare. Possibly leaders will need to identify and articulate other benefits from this technology. Or perhaps they will need to find ways to share the costs of adopting this technology so that participants feel it is less of a burden in comparison with the expected benefits, which are uncertain.

A pilot test can help reveal both benefits and risks in advance of a broad rollout. But when pilot users become accustomed to the benefits of an interorganizational system, terminating according to schedule can cause dissension. For example, the Internet Payment Platform had some early proponents who did not want the pilot test to end as scheduled. A participant from the Bureau of Engraving and Printing stated: "We're not on anybody's Christmas list anymore, because [the personnel in accounts payable] really don't want to stop using IPP. It made life so much easier for them." Suppliers reported that they valued the ease of creating an invoice by "flipping" a purchase order, the ability to track orders online, and the faster invoice and payment processing. Most participants agreed that if it were possible to require every federal agency and all of their suppliers to use IPP, the financial benefits would be compelling. However, because suppliers also do business with government agencies that did not participate in the IPP pilot, as well as with other commercial organizations, they were unsure whether the effort to adapt their systems to IPP would result in long-term savings.

Lessons Learned

Long-term viability of collaborations usually depends on achieving a critical mass of participants. Some key stakeholders may not be in a position to collaborate, because of limited resources, insufficient skills, or leaders who lack the right kind of experience. When the number and diversity of participants increases, they can bring pressure to add or revise goals, which

slows the project down and generates discontent in other quarters. A successful plan for recruiting and retaining participant agencies must take into account the constraints and motivations of each participant, to make sure each comes away with benefits that exceed their own costs and risks.

P3. The Challenge of Getting and Keeping Support: What Roles Do Champions Play?

The five cases reveal that champions help secure initial funding, build a case for a shared business model and long-term funding, recruit and retain participants and constituencies, and protect the project from its competitors or critics. Their absence leads to delays or roadblocks. Every one of the five interagency collaborations benefited from leaders who acted as champions for the initiative. Champions are key to moving large-scale or mission-critical projects forward.

The five cases further reveal that interagency collaborations need multiple champions—for more purposes, and across more levels and more functional areas—than conventional systems projects. When many organizations are involved, each participating organization needs its own champion. Champions tend to be one of two types:

- *Externally facing champion:* a leader who participates in high-level discussions about shared purpose and goals, and who publicizes his/her organization's role in the collaboration
- *Internally facing champion:* a leader who ensures that the employees or organizational members who need to participate actively in collaboration processes and/or use its systems are appropriately trained and given appropriate incentives to participate

In some organizations, one individual will play both roles, but more often, two or more different leaders are needed in the roles of external and internal champion. Moreover, the roles of champions change over time, according to the stage of the project (initiation, system and process design, development, implementation, ongoing usage). Champions retire or leave, and their replacements usually have different agendas and management styles. Those who stick their necks out to acquire significant funding for an interagency collaboration certainly expect the constituencies they represent to benefit from the collaboration. If this is not forthcoming, they may use their political clout to sabotage an initiative they once supported. After all, as originally attributed to former Speaker of the U.S. House of Representatives Tip O'Neill, "All politics is local."

Politically well-connected and savvy leadership is clearly helpful if not essential. If leaders are not themselves highly effective communicators, they need to enlist champions who can help generate and maintain outside support for the collaboration. Current WLIC Chair Deb Reinhart illustrated some of the ways external champions helped to move the Wisconsin animal identification agenda forward:

> … Because we piloted the premises identification plan for the USDA, and because we've been at the table on this issue, we've had a lot of influence with our legislators in Washington. Nationally we have influence. When we attend national meetings on the issues, attendees want to hear what we have to say. It amazes me to see the response we get and the amount of teaching that we are doing in the industry.

California's INC system owes its success in part to the support of its executive officer, who protected the Franchise Tax Board from external political influence during his 25 years of leadership. His leadership was especially valued for providing "amazing stability through several political changes—and you don't see that in other states typically," according to the bureau's director. The executive director retired in August 2005, and his successor was appointed in January 2006.

Champions lobby externally for resources and recognition. The director of the Centers for Disease Control and Prevention was important in gaining funding for the BioSense project. In addition, several well-placed physicians and public health professionals served as champions at the local level, including a highly regarded physician/statistician at Children's Hospital in Boston. Other supporters published studies in influential refereed publications, validating the efficacy of the data sources and statistical methods used by BioSense and raising its prominence in the medical community.

Champions also are needed at the local level. Two individuals from two state departments of transportation got seed funding for CapWIN. A police chief in

one state subsequently took on the role of fundraiser, and a fire chief who played an important role during the 9/11 attacks on the Pentagon also became an effective spokesman for the project. At the grass-roots level, however, a shortage of champions caused some delays. The CapWIN field operations coordinator had difficulty setting up schedules for training officers from local police departments and getting closure on resource requirements and completing development of IT interfaces. This suggests that while it is important to have champions at the highest levels, it is also important to verify that the staff on the ground understand how important their roles are in moving the work forward.

At Treasury, a high-ranking manager provided resources to the IPP project, but there were difficulties inducing federal agencies to participate, despite initial interest. Agency managers who did come on board wanted to be seen as proactive by participating in pilot tests such as this one. However, some were then reluctant to involve many of their suppliers for fear of damaging their relationships if the technology did not perform as hoped or if it was withdrawn at the end of the pilot.

In an interorganizational context, champions serve multiple functions and interact at each level of the collaboration. A single champion in the project's developmental stages will not be sufficient. Not only do champions leave and need to be replaced, but also the political landscape changes, posing different priorities and problems over its life span.

Lessons Learned

Galvanizing events, no matter how dramatic, do *not* cause organizations to change; leaders do. They do so by interpreting events, articulating a clear case for action, enlisting the support of others who can help by providing resources or skills, and leveraging pre-existing relationships. Champions gain resources for an initiative, recruit and encourage participants, and protect the project from critics. The complexity and multiplicity of stakeholders in interorganizational systems seem to require multiple champions at multiple levels: within the collaborative enterprise and within each participating organization, and among its stakeholders and external power brokers.

Administrative Challenges

Not far behind the challenges of the political environment is the challenge of how to get something done in a collaborative manner, in a way that the various players are constructively engaged. We highlight three aspects to this challenge: developing a collaborative approach to governance of the overall effort, actually implementing the plans developed by the team, and securing financing for both the initial development effort and long-term operational viability.

A1. The Challenge of Governance: How Does the Leadership Group Exercise—and Agency Participants Delegate—Control Over the Collaboration?

Collaboration poses administrative challenges for participating agencies and their employees, as well as for the organization that manages the overall initiative. Oversight may be vested in an existing organization such as the U.S. Treasury's Financial Management Service (which managed the Internet Payment Platform pilot test) or the California Franchise Tax Board (which created the INC initiative). Alternatively, a new organization and governing board may be established, as in the cases of CapWIN, BioSense, and the Wisconsin Livestock Identification Consortium.

Governance entails establishing formal oversight roles and working relationships along with a shared

Political Challenges: Key Lessons Learned

1. Compelling events do not necessarily succeed in galvanizing interagency initiatives. Effective leaders do not wait for a crisis before they issue their call to action.
2. Legislative and regulatory requirements can act as a catalyst or impose constraints. Requirements may be contradictory and will compete for time, attention, and resources.
3. Long-term viability depends on achieving a critical mass of participants, but increasing their number and diversity can bring pressure to add or revise goals.
4. Interorganizational systems require multiple champions at multiple levels, and these needs and roles change over time.

understanding of the goals of an initiative and the rights and responsibilities of each participant. Typically, inclusiveness and representation are accomplished through designated or elective seats on the decision-making board. Through negotiation or fiat, agreements must be forged to establish the collaboration, with sufficient flexibility to accommodate growth and change. The case examples revealed that as new participants join up, they too want a say in the direction of the initiative.

CapWIN spent a year on strategic planning and was advised on governance by George Mason University. The resulting institutional infrastructure was administered by the Center for Advanced Transportation Technology at the University of Maryland (UMD-CATT); its director reported to the Executive Leadership Group (ELG). The ELG is working on implementing a formal governance structure under a Joint Powers Agreement to be signed by the governors of Maryland, Virginia, and the mayor of Washington, D.C. This agreement could lead eventually to an interstate compact.[21] In 2005, CapWIN examined possible affiliation with CapCom, a proposed regional transportation entity representing each participating jurisdiction. The resulting umbrella organization would be known as the Mid-Atlantic Communications Interoperability Partnership, or MACIP. Under the reorganization, CapCom would join CapWIN as a parallel organization jointly governed by the Executive Leadership Group, which would be expanded to include four new slots that balance transportation's representation with the public safety side. The CapCom entity and its formal affiliation with CapWIN is still under negotiation.

The Wisconsin animal identification initiative first came together in an ad hoc manner, and subsequently WLIC leaders struggled with how to include relevant stakeholders. One founder explained, "After we couldn't carry it, I and a few others wrote a mission statement, strategic objectives, and got some articles and bylaws ready to form this consortium." WLIC's membership base has grown, and in 2005 the board was expanded to 12 seats. According to its current head:

> The new model is to find consensus on our board and encourage them to look at the middle ground. Often, as the chair of this consortium, I feel like a driver at the head of a team of horses, trying to get the team headed in the same direction and pulling in tandem. Each species group has agreed to work together. Our goal now is to get more inclusive representation by adding horse breeders, chicken or pig farms, etc., to the board. It has proven difficult in this dairy state to get other interests elected to the board so their needs can be understood and addressed.

The Internet Payment Platform faced different governance issues from either CapWIN or WLIC, because it was a pilot test sponsored by the emerging technologies arm of its parent agency, the U.S. Treasury's Financial Management Service. A project manager made most operational decisions in consultation with staff and based on input from participating agencies, vendors, and other constituents. Since this was a pilot test, this "top down" governance structure was seen as appropriate.

The challenges of working out and enacting appropriate governance structures are evident in these case examples. A well-designed governance structure will ensure that stakeholders have a voice, while simultaneously ensuring that the structure itself does not become a bureaucratic roadblock.

Lessons Learned

An administrative structure for interagency collaboration usually includes a governing board and formal or informal agreements about key relationships among parties to the collaboration. The founders need to plan its governance structure to accommodate representation of key participating organizations and/or stakeholders, understanding that these will change over time. The board may need to be expanded and new seats may need to be designated for particular constituencies. Sometimes it is necessary to entirely reorganize a governance structure as an initiative matures.

Three governance models are represented in these five cases:

- Central control by a government agency
- Consortium of business and government leaders
- Interstate compact, with broad representation across functions and jurisdictions

Centralized control by a single agency simplifies governance challenges, but carries the inherent risk that stakeholders will feel they do not have a strong say in the direction of an initiative. The consortium and interstate compact approaches help to ensure broad representation, but can become bogged down in cumbersome deliberations or be subject to crippling scope creep as attempts are made to satisfy every constituency. While there is no "best" form of governance, it is clear that management of these initiatives entails walking a fine line between including all affected stakeholders and limiting the size of the governing organization to best propel it forward.

A2. The Challenge of Implementation: What Is Needed to Make It Work?

Sharing data through interagency collaboration requires the creation of new relationships and interorganizational processes, and often also requires changes in participants' internal organizational processes. Participants will face implementation issues around training, staffing, and change management. Resistance can be encountered at multiple levels and at various phases of the project. We observed that collaboration leaders were sometimes unaware of, or failed to plan sufficiently for, internal organizational changes and disruptions. A governance structure that provides for early and continuous input from stakeholders offers one means of addressing these problems as they arise.

Seemingly minor implementation issues can create big headaches as they multiply over repeated iterations for each agency or for many employees. For example, the CapWIN field operations coordinator experienced difficulty setting up training schedules that would accommodate personnel from several local police departments at once. Some sessions were canceled when officers were needed back on the job. And, once trained, some officers complained about having to learn to use a system they felt had limited immediate utility, and about frustrations they experienced with glitches in the system.

Some implementation issues are of the most basic sort. The director of the Wisconsin Livestock Identification Consortium explained:

> This is something that's never been done. We have nothing to reference it against, so now if there are 70,000 premises, and we get 40,000 premises registered, how do we get the other 30,000? The problem is we don't know if there are 70,000; we don't know if there's 90,000.

Hospitals are just beginning to exchange clinical data with each other and with public health officials at the local, state, and federal levels, and the BioSense case illustrates both the opportunity and need for redesigning patient-care and public-response processes. Dr. Kenneth Mandl of Boston's Children's Hospital Medical Center explained the implications for public health processes:

> In the past, public health procedures were geared toward a passive system of mandatory and voluntary reporting of cases of disease. The investigation process emphasized individual-case follow-up.

Similarly, the Internet Payment Platform represents a change in how agencies operate. The director of financial systems at the Department of Labor described problems with their pre-IPP process:

> The way the process works today with pieces of paper floating around and signatures and stamps, things get lost. They're not tracked. There's not a workflow or automated e-mail engine to send a reminder to say, "Hey, it's been three days, why didn't you approve this?"

The workflow component of IPP streamlines buyer-supplier processes by pushing purchase orders and invoices through the system, controlling the processes and approvals through automated e-mails. Process redesign has implications for staffing: Roles and responsibilities frequently change. The Department of Labor saw IPP as instrumental in changing how some employees work. It was hoped that accountants would assume more of a financial consultant role as they shifted time and effort away from day-to-day transaction processing activity toward analytical review and decision support.

It is easier to implement a new system if it complements existing procedures and requirements, especially those that cannot be changed because of a legal mandate. The Bureau of Engraving and Printing

raised concerns that the IPP software did not allow sufficient space to enter all of the text that needs to accompany purchase orders. IPP also did not provide an audit trail of all change orders and did not provide for a contracting officer's digital signature. A participant from the bureau emphasized this mismatch between software functionality and user requirements: "The government is very serious about who is authorized to obligate the government in terms of a contract, and who is not." These were critical design elements that, if not addressed in a post-pilot version of the IPP system, would impede the bureau's use of the system.

Some organizations such as WLIC addressed implementation issues by adopting a phased-in implementation approach. Following USDA's National Animal Identification System guidelines, WLIC will move forward in three steps (premises identification, animal identification, and animal tracking). Both BioSense and the California Franchise Tax Board took a phased approach by first choosing readily available public and private data sources that were likely to achieve a good return on their investment of implementation time and resources. Both BioSense and CFTB will add data sources incrementally, and they have established criteria for assessing when they have reached a saturation point.

The IPP initiative also took a phased-in implementation approach, and its sponsors at the U.S. Treasury's Financial Management Service (FMS) avoided taking on overly ambitious goals. Drawing on lessons learned from an earlier, more broadly focused payment technology initiative, FMS designed IPP for a narrower target, focusing only on the government agency purchase-to-payment cycle and testing the system with just three federal agencies and a subset of their suppliers. In contrast to the earlier initiative, the IPP pilot took place over a much shorter time period. Once this pilot ended, a new project was approved to modify the system and roll it out to a larger set of government agencies.

Phased-in implementations help to minimize organizational disruption and to control costs, which can be very helpful while leaders seek to secure additional funding. On the other hand, for CapWIN and the Internet Payment Platform, this tactic disappointed some participants because the benefits of joining the collaboration had to be deferred (firefighters) or suspended (at the end of the IPP pilot when the decision was made to design a new expanded system).

In all five cases reported here, participation involved changing operations to be compatible with the new interagency system, yet these process changes were applied only to a subset of possible transactions (because the project was either a pilot test or early in the rollout). This meant that each participating organization took on extra costs in running redundant systems or maintaining duplicated databases. As noted earlier, collaborators need to find ways to minimize the costs of participation. A road map should show participants when they will be able to fold the new processes into their routine operations or replace their old processes with those developed through the collaboration.

Lessons Learned

Implementation of information-sharing initiatives is complicated by the difficulty of the collaboration task itself, the project scope, and the number of participating organizations and their staffs. Because the user base for an interagency collaboration may be quite diverse, requirements that appear trivial to some participants can be major impediments for others. Administrative readiness means having adequate financial and human resources, with the right mix of skills and previous experiences. An interagency initiative will falter if its leaders make unwarranted assumptions about the level of readiness of the participants. Requirements specifications must take into account the varied operational processes and administrative constraints across all participating agencies to prevent surprises when users come on board.

Every interagency collaboration gives rise to changes in operational processes, so participants should anticipate making accommodations to implement and support the new collaborative system. Project managers often fail to adequately plan for implementation issues around staffing and retraining. Several of the organizations in our study underestimated resource requirements. Often the most satisfactory solution is to break the project down into a series of steps or phases that proceed according to an announced sequence or timetable about which participants have been consulted.

A3. The Challenge of Financing: How Can a Viable Business Plan Be Achieved?

Financing is a key enabler for both the initiation and long-term operational success of an interagency collaboration.

Leaders may begin by pulling together funds from a variety of sources, and we observed several successful examples of this. Soft money typically is legislated or awarded by one or more government agencies to support planning and building an interagency system. Each new funding source, however, brings added risk in the form of changes in project goals, timetables, or priorities to accommodate each funder's perspective.

Initial funding rarely covers the costs to implement change on a broad scale. A common solution is to obtain funding for complex projects in stages that correspond to adding functionality and/or broadening participation. Initial funding was somewhat easier to achieve when a single agency spearheaded an initiative. For seed funding, an agency can sometimes apply for a targeted appropriation or include the project expenses in their operating budget. In contrast, when a consortium is created to govern an interagency collaboration, the message becomes more complex and this can add complications to funding requests. Champions need to develop relationships with potential funding sources and then piece together deals that will satisfy each funder's goals.

Some of the leaders in our case studies did not have a fully developed plan for ongoing support beyond the capital-investment phase, when it would be time to move from pilot project to operational reality. The long lead time needed for governmental budget requests increases the challenge of obtaining ongoing support. Some leaders made an important trade-off that can jeopardize future success: To ensure participant buy-in, they allowed an extended period of free trial participation in the collaboration. A viable long-term business model requires that all participants agree to share in both the costs and benefits.

We also observed that as more and more interagency initiatives cross jurisdictional lines, competition for funding by local, state, and federal collaborations becomes stiffer. Jurisdictional competition for funding was clearly a concern for BioSense. Following 9/11, the anthrax attacks that fall, and later the Iraq War, the total amount of funding for syndromic surveillance increased greatly, and some funds that previously were earmarked for states were transferred to the CDC. In testimony before Congress, one critic commented:

> BioSense … is a worthy, if highly experimental, project for the nation. However … it will be local health departments that, when alerted to abnormal disease trends, will do the legwork to validate such suspicions and actually manage the outbreaks. Reduced funding for state and local agencies defeats the overall vision.… Both nationwide projects and local capacity need support, not one at the expense of the other.[22]

CapWIN received initial funding from the U.S. Department of Transportation in response to the bridge jumper incident, but subsequent terrorist events caused funding sources to focus on homeland security. The Department of Defense and National Institute of Justice became key sponsors of the CapWIN project, and CapWIN was named a standing test site for Homeland Security's Project SafeCom. A key member of the CapWIN team commented:

> Out of 9/11 came CapWIN, because that ensured our funding. There had been a request in for funding, and the money was provided through the post-9/11 DoD appropriations. Would it have happened without 9/11? I don't know.

Some interagency initiatives cobble together funding from a broad mix of sources. For the Wisconsin Livestock Identification Consortium, the first funding took a long time and hard work to procure. According to one of the founding members:

> We struggled along for three years, and then we had connections with the National Cooperative Business Association and we paid dues to them; we were on the board of that organization and I was chairman of it. We got their lobbyist to help us and were able to get some money earmarked for the program. That's how the initial funding came.

Today the Wisconsin initiative is supported by a mix of state and federal sources. An Agricultural

Diversification Development grant from the Wisconsin Department of Agriculture, Trade and Consumer Protection provided initial funding. Congress appropriated $750,000 in year one and $1 million in years two and three to the USDA/APHIS/Veterinary Service to establish a cooperative agreement with WLIC.

Project leadership must undertake a great deal of legwork to ensure continued financing before an interorganizational collaboration becomes self-supporting. Long term, success depends on the willingness of a critical mass of participants to use the system and to contribute financially and operationally to its maintenance and growth.

Not all potential participants are equally eager to join in. In California, a disconnect between where the costs and effort occur in sourcing data, and where subsequent benefits accrue, has made it difficult to garner buy-in from some important agencies. A few years ago, a proposed law was pending to force cities to share data about license owners with the California Franchise Tax Board. According to the director of the Filing Compliance Bureau:

> The cities made a huge stink … saying, "Oh, my gosh, we can't provide the data; we don't have the right IT platform to do that. We need money from the state of California." The non-revenue part of government does not view sharing data as an opportunity for the greater good. We could say to them, "If you give us that data, we are going to generate $10 million of additional revenue for the state of California." The response will be "but that's not revenue that accrues to our agency; we don't get credit for it."

The California Franchise Tax Board will not pay for system upgrades at other agencies. As a result, they either had to forgo using these data sources, or recode and re-enter poorly organized data upon receipt. In recent years, however, CFTB has been able to negotiate better data exchanges with more government agencies than was the case when the INC project was first deployed.

User reliance on a shared system increases its likelihood of achieving widespread buy-in, but systems that support occasional or exceptional situations have a much more difficult path toward acceptance by a critical mass of agencies and users. While BioSense was originally envisioned as a system that would detect bioterrorism events, it quickly became obvious to its users that outbreaks of naturally arising diseases also could be tracked with the system. Setting this broader social goal increased the perceived value of the system and expanded its usefulness to a wider set of locations and users. Like CapWIN, BioSense has demonstrated its utility in both dramatic, exceptional situations and in more routine, common ones.

CapWIN is still developing its technology and building an initial user base. A big issue it faces is figuring out when and how to become self-sustaining. Without a critical mass of users, it will need additional outside funding to develop the basic infrastructure and get more users on board; CapWIN also plans to begin collecting user fees by 2010.

Fees and technology expenses are also an issue for the Wisconsin initiative. WLIC currently is funded by federal money administered by the state's Department of Agriculture under a short-term contract. Its financial situation is tenuous because the state legislature took away the ability to charge a fee. Legislation now requires use of tax dollars and federal money instead of a $20 producer fee. The WLIC has no way to raise revenue apart from the $100 dues it charges to join the consortium. On the producer side, animal identification ushers in a major new operational expense. Since the cattle industry has recommended RFID devices for individual animal identification, RFID readers will need to be installed. One interviewee informed us that there are 30 million newborn cattle per year. An RFID tag currently costs between $1.50 and $2.50, so the total yearly cost of tagging newborns could be between $45 million and $75 million. Since RFID tag costs are expected to drop significantly in the next few years, many farmers prefer to wait.

In contrast to the other case examples, the California Franchise Tax Board established a viable business plan from the outset. They hired IBM Global Business Services to build the initial INC system, at a cost of about $61 million. CFTB uses a performance-based procurement method for large expenditures of this type, so that IBM was paid only as increased

Administrative Challenges: Key Lessons Learned

1. Governance structures need to accommodate representation of key participating organizations—and these change over time, requiring reorganization or expansion of their boards.
2. An initiative may falter or even fail if its leaders make unwarranted assumptions about the level of readiness of the organizations that should participate. Participants should anticipate making accommodations to implement and support the collaboration.
3. Project managers often fail to adequately plan for staffing and retraining. Consulting participants and proceeding according to a series of announced steps or with a phased-in timetable helps.
4. Adoption depends on achieving both financial and operational value for all stakeholders in excess of their costs and risks. It is difficult to obtain financial commitment when benefits accrue more to the common good than to individual participating agencies. Expanding system functionality or adjusting the technical requirements to achieve buy-in will increase costs and risks for the collaboration.

revenues accrued to the state due to the use of the INC system. In this way, both organizations had an incentive for the system to become operational and productive as soon as possible. A CFTB manager stated:

> It's an incentive to them to deliver a system that is free of bugs and defects, and that includes the functionality that we had specified in our requirements. It's an incentive for us because the sooner we can pay them off out of the benefits, the more revenue we have for the state.

The INC project was paid off in about four years, and today INC is maintained as part of the regular operational budget of the CFTB. Since they did not need to await a special budget allocation or other capitalization delay, the California leaders also were able to begin the project in a timelier manner.

Lessons Learned

Systems and programs that cross agency lines are rare in governmental circles, where hierarchical structures and long budgetary cycles impede shared funding. While securing initial funding is a necessary first step, it does not ensure success. Articulation of a viable business model and attainment of a critical mass of users are also essential elements.

Interviewees stressed that long-term viability depends on establishing a business model in which all desired participants will achieve benefits that exceed their costs and risks, and clearly communicating these to stakeholders. Each participating organization will evaluate the value of the business model with respect to its own goals and constraints. And some benefits accrue more to the common good than to individual beneficiaries. This "collective good" aspect increases the difficulty of obtaining financial commitment from participants. To achieve buy-in, it may be necessary to expand the system functionality or adjust the technical requirements; yet doing so will increase the costs and risks that come with scope creep.

Technical Challenges

The challenges that most practitioners begin to tackle first, and often believe are the most difficult, are those requiring technical know-how and a high degree of attention to details. We highlight three that were common in the case studies we examined: sharing data across agency boundaries, the role of legacy computer systems in confounding collaboration, and the difficulty of setting and adhering to a common set of standards.

T1. The Challenge of Data: How Are Data Shared Effectively?

Implementation involves challenges related to the data that are to be shared and to changes in organizational and interorganizational business processes that will support the sharing of data.

These case studies have in common the objective of sharing data across organizational boundaries. Yet, major concerns arise over the ownership and stewardship of data that are to be shared among participants or collected by a coordinating agency

or consortium. When data cross boundaries, new challenges arise in ensuring security and privacy. Not surprisingly, deliberations regarding what data may be shared and under which circumstances are often contentious and protracted. To formalize the agreement, legislative action and/or multiple approvals from external bodies may be required.

Sometimes collaboration leaders will choose among many available data sources. Choosing the most cost-effective source is usually the preferred path; however, sometimes more expensive, more time-consuming, or more error-prone options prevail. For example, the California Franchise Tax Board and other tax collection agencies certainly could purchase data from commercial data brokers such as ChoicePoint, whose business is to collect and sell access to data that have been culled from publicly available sites. However, because of citizen privacy concerns, the CFTB instead chose to obtain data primarily from other government agencies, reformat the data, and compile its own warehouse of data, even though this approach is costlier, takes more time, and may not contain all of the data that are otherwise available commercially.

Some collaborative initiatives had an issue with data redundancy and potential inconsistencies across different legacy data sources. For example, the BioSense software sometimes gathers data from multiple sources about a single individual, location, or type of event. Each source may provide unique data, an update to a prior data feed, or even data that contradict data from another source. Since each data source has strengths and weaknesses, there is reason to employ multiple data sources. For example, laboratory order data are helpful in providing a timely indication of an outbreak (since physicians tend to order lab tests early in the patient encounter). But the same lab order may generate multiple updates (i.e., order received, order in process, results). So, a decision was made that for a given lab order, the BioSense software would select the most recent message related to it from the data that are fed into the daily analysis. Also, the same virus or bacterium can cause multiple problems, such as fever, vomiting, or lethargy, so doctors often generate multiple diagnostic codes and also often order multiple tests on a single patient, which can introduce some noise into the data.

The U.S. Treasury designed the Internet Payment Platform around a centralized database, which was expected to contain a single, authoritative copy of data that would be accessible to all parties to a purchasing transaction. Throughout the transaction cycle, data could be added to this repository by any of these parties, and each participant could download data related to their own transactions to populate their internal accounting systems. However, actual usage during the pilot test revealed some problems with this approach. First, the IPP utilized commercial software that had been partially customized, but this software restricted the amount of data that could be reflected in each transactional record. Specifically, fewer than 1,024 characters of descriptive text could be included on a purchase order, in direct conflict with the requirements for some government purchase orders. As a workaround, legally binding paper versions of these purchase orders were mailed to vendors, while the sub-optimal electronic version was entered into the database.

A second problem arose from IPP participants' views regarding ownership of their data: Most participants chose to replicate a copy of their transactional data on their own accounting systems, in direct competition with Treasury's expectation that the "authoritative" version would be located centrally. If this system were in long-term operation instead of at the pilot-test phase, then a formal understanding defining the authoritative version would need to be reached and ratified by all parties.

The BioSense initiative took a somewhat different approach. Before importation, patient records are stripped of data that are not needed by the BioSense system. For example, a ZIP code might be retained, but the rest of a patient's address would be stripped off, along with most of the treatment details. The BioSense leaders explained that since physicians and other caregivers are already subject to strong sanctions if medical data are misused, and since HIPAA regulations specify what is and is not acceptable use of patient data, there is already a workable framework in which to protect privacy and security while nevertheless retaining some useful data in a central repository.

The Wisconsin Livestock Identification Consortium has begun collecting data within the state while awaiting a national repository that does not yet exist. Many separate national initiatives capture some of

the necessary animal identification data, such as one used by dairy improvement cooperatives around the country, which collect the raw data from farms at the production level of cows. Beef cattle or hog data are collected by private associations, without an integrated government-led approach. A national repository is needed because animals can physically cross state lines. And, with the confirmation in 2005 and 2006 of two more BSE-infected cows in the United States, concerns have intensified. For some time, the USDA's position was that private industry should collect the national data. (In contrast, Europe and Canada have national-level repositories.) Just recently USDA announced it will develop the necessary software to connect across the various databases so that queries can be run as if there were a central repository. Cattle ranchers and other agricultural leaders are uncomfortable about revealing information regarding farm locations, number of animals owned, and other proprietary information. They fear that competitors, environmental groups, or those who are in a position to manipulate prices could use this information in ways that would be detrimental to individual farmers or to the industry as a whole. So, implementation of the virtual national repository will require careful balancing of these concerns with food safety concerns.

To offset unease about data ownership and stewardship, some collaboration leaders chose to design a system architecture that provided access to data but did not actually retain a copy of it. This is the case at CapWIN, which provides a secure medium for access to cross-jurisdictional data. (First responders often require rapid access to a great variety of databases—criminal justice, public health, transportation, hazardous materials, etc.—that are distributed across organizations in multiple jurisdictions and subject to a variety of restrictions.) CapWIN does not "own" or replicate any data shared by its participating agencies. The only records kept centrally reflect data that describe each incident and that are generated by CapWIN itself. Each participating organization retains stewardship of its own data, and each organization is responsible for its own user authorizations and access restrictions, and for disciplinary actions necessitated by any misuse of the system.

The timeliness of data flows supporting collaboration across agencies represents another important challenge. The faster the data must flow from creation or source to use, the greater the data and process management challenges. CapWIN needs real-time access to data during emergency situations. BioSense is intended to identify disease patterns that are observable in as little as a few hours or days. NAIS, of which Wisconsin's animal identification system is a part, has 48-hour trace back as its goal. The Internet Payment Platform is not as time-sensitive, although users are likely to upload data on a regular basis, perhaps daily or weekly. At the other extreme is the INC data warehouse, for which some data sets are updated monthly or even annually. Given this range, the procedures that interagency initiatives adopt to support and control data sharing will vary tremendously.

Lessons Learned

Data management posed major challenges in every one of the cases. One issue pertains to ownership and stewardship of data. Replication of data in a central database can give rise to implementation and acceptance problems, but these can be at least partially addressed by establishing clear policies around ownership, access rights, formatting requirements, and stewardship that ensure the centralized version is secure, correct, and up-to-date. Even then, resistance on the part of data owners may impede reaching agreement on these policies and ultimately prevent the sharing of data.

The privacy and security of shared data are also major concerns. Some collaborators dealt with these concerns by stripping data sets of identifiers. Others set stringent access rules, monitored actual usage, and imposed strict penalties on transgressors. Where data are accessed and stored only at the source, data owners' security concerns were reduced and data quality was maintained.

We observed that participants will share data far more readily than they will cede either ownership or control over access. Data-sharing issues are easier to address when data are owned, retained, and maintained by the originators.

T2. The Challenge of Legacy Systems: What Are the Technical Roadblocks?

Most electronic government systems are built on top of existing agency or commercial applications and run on or alongside an existing infrastructure. The biggest technical challenges occur at the

intersection of participant systems with each other or with a central component.

A legacy system is a double-edged sword. Without it, an organization is unlikely to have amassed sufficient experience to be ready to engage in an interorganizational collaboration. And, absent the valuable data that are typically stored in legacy enterprise systems, there may be little reason to collaborate. Problems with data management are widespread among government legacy systems. A common challenge is obtaining access to the right data in a usable format in a timely manner. And, older technology—whether hardware, software, database, or communications devices or protocols—is not well suited for implementation of advanced collaborative systems. Legacy systems are difficult to change, and can restrict the amount and type of data shared and communications supported. They impose constraints that cannot be avoided because of the significant investments made in them and high replacement costs, which can result in sub-optimal designs and/or implementations, or lead to reduced functionality. Adaptations to the design or implementation of the collaborative system due to constraints imposed by participants' legacy systems were frequently encountered in the case studies.

CapWIN "solved" the technical problem of integrating with incompatible agency-specific systems by running alongside them. In essence, the CapWIN client software and hardware are installed in a first-response vehicle next to an existing legacy tool, as a kind of "sidecar." This requires the user to interact with two independent systems, with CapWIN supporting only those incidents for which the user must contact other agencies or cross geographic boundaries. Some first responders feel it's too much trouble to use a second system, which requires that they remember separate operating instructions. In some settings (such as the cab area of a fire engine), CapWIN hardware takes up scarce physical space. CapWIN has been more successful with small, poorly funded agencies that had not been able to afford their own systems and therefore have no legacy systems to augment. For these agencies, CapWIN provides both intra- and interagency support.

The Internet Payment Platform was built upon a commercial application that was designed to support private sector e-payments. Because the software was originally written for commercial use, its adaptation to the government domain proved somewhat problematic. Xign's software worked with all major enterprise resource planning software packages, but some federal agencies' accounting software was based on older technologies. For example, the Bureau of Engraving and Printing used a package that was originally purchased in 1985. To work with these older packages, an "enterprise adapter" module needed to be written to first extract records from the bureau's legacy system and then translate the purchase order data into XML. Thus, this solution built a bridge between the old and the new, and translated data formats outside of both participants' systems.

The California Franchise Tax Board found that it was unable to obtain data in a usable format from many of its potential sources, because legacy systems at the source organizations were not able to produce data files in a useful format, and the organizations did not have sufficient resources to replace the old systems. The tax board has been approached repeatedly by some of these organizations, with requests to pay for upgrades so that they could send the data files to CFTB. However, since the added value of the data was not considered to be worth the cost of the upgrades, for purposes of the pilot study using these sources, data were sent in a spreadsheet and manually entered.

Most participants agree that technology is rarely the component that determines whether or not a collaboration will achieve its goals. In the words of one interviewee at the CFTB, "I really think technology issues are secondary; even though there are challenges there, we anticipate solutions coming forward in the future to share data among government agencies." Nevertheless, technical problems—particularly those arising from the constraints imposed by government agencies' legacy systems—can pose major impediments to collaborative success, and may even become "showstoppers" for some participants. If those participants are key opinion leaders who prevent a project from achieving critical mass, then the technical impediment can become a showstopper for the project as a whole.

Lessons Learned

Technical issues pose many of the day-to-day challenges encountered in creating an operational

interorganizational system. Solutions usually can be found, and technology is rarely the sole cause of a collaboration's failure. Yet, careful attention to a variety of important technical details during planning will ease the development process and help establish user buy-in. The most significant technical challenges arise at participating organizations' boundaries. Tie-ins to legacy systems place limits on system architecture and on the ability to adopt state-of-the-art solutions. Feasible solutions for dealing with legacy systems include budgeting for participant system upgrades, building one or more translators to move data back and forth from old to new systems, implementing manual workarounds for incompatible communication and data formats, and adapting system specifications to work within the limitations imposed by the older technology.

T3. The Challenge of Standards and Sourcing: How Can the System Best Employ Available Building Blocks?

Each interagency collaboration faced many decisions about the role of standards, including standards for communication, security and access methods, data definitions, and devices used by the collaborative system. Standards may be de facto (e.g., Microsoft Word documents) or de jure (e.g., XML, EPCGlobal, EDIFACT). The collaboration leaders may enforce adherence to some standards while taking a neutral stance on other aspects of the overall system architecture. Or, lacking political clout, they may promote various standards but leave it to participating organizations to decide which ones they will adopt.

Agencies' hardware and software sourcing decisions may be mandated or optional, and this choice can affect who will participate and at what cost. Some interorganizational systems (or portions of these systems) rely on open-source software (for which publicly available source code is shared freely and augmented by its users), while others utilize proprietary software (and the vendor retains control over the source code). Some vendors do not allow purchasers to change functionality, while other vendors give purchasers the ability to customize their software. Yet another choice is to utilize a single "frozen" version of an open-source application. These decisions will affect the system design, implementation cost, and complexity of an interagency collaboration.

At the outset of an interagency collaboration, pertinent standards may not yet exist, or different standards already may have been adopted by different participants. This is evident at CapWIN, and in fact provided the initial impetus for funding the system. Communications interoperability is the ability of first responders to communicate over a variety of wired and wireless networks in real time with counterparts from other jurisdictions (such as when a Virginia police officer confers with a Maryland police officer about a suspect who has just driven across a bridge from Virginia into Maryland), as well as with first responders from different disciplines (such as when police, fire, and EMS responders coordinate in response to an accident or terrorist event). In the United States, decisions about wireless communications standards and related networking technologies for police, fire, and other first responders have been made at the local or state level, resulting in a proliferation of incompatible networks and devices. Early in the project, the CapWIN design team adopted communications standards that allow incident responders to communicate easily and securely. The Internet provides the link among responders using secure instant messaging. (This will soon be replaced by Voice over Internet Protocol, or VoIP.) And, unlike the other four case studies, the CapWIN initiative benefited from having a team member whose full-time responsibility is to participate in national and international standards-setting initiatives and ensure that CapWIN makes the right choices.

Data-sharing standards are an essential aspect of interagency collaboration, yet not one of the five cases we observed had a completely workable solution in place. The time and cost of building California's INC data warehouse has been considerable, especially with the reformatting challenges raised by collating data from a myriad of local agencies with different approaches to data collection. Locating usable data and reconciling it with tax filings is tedious and difficult, especially since some sources do not have an electronic means to transmit the data. For example, some agencies collect Social Security numbers and some do not; data records without it need to be matched by name and address instead. Mandating a common identifier (Social Security or a federal taxpayer ID number) would improve the quality of their data and decrease data compilation costs.

Some existing standards provide only partial functionality for the shared environment. Medical data is one area where standards are both prolific and inadequate. While the national HL7 standard is commonly used for coding health data, not all needed data items can be encoded as yet—for example, the free-text descriptions of chief complaints. There is not yet a fully standardized nomenclature for physicians to describe what they see and hear. And, although the codes used to describe various procedures and tests tend to be homogeneous within a care setting, they are not yet standardized across settings. BioSense will benefit greatly when HL7 (or another standard) supports the full range of data types it needs for comparison purposes.

Competing technologies often vie for de facto or de jure ratification, and this creates uncertainty for collaborators. For example, the USDA's proposed National Animal Identification System specifies data standards (the numbering scheme), but thus far, NAIS describes these as "voluntary." And, USDA has not yet specified national standards for livestock management tags and tag readers. Consequently, different tag technologies (including multiple forms of RFID tags) have been adopted by different producers. This complicates the compilation of identification data, as not all producers are collecting data in the same way (even though many do adhere to the voluntary data standards). Since NAIS data are collected at the state level, efforts to combine state data into a national database may be impeded by these choices.

Designing and then getting users to adopt an interagency system is easiest when eventual participants already adhere to common standards and adopt common hardware and software sourcing rules. Where standards and sourcing guidelines are missing or varied in present use, the options are more risky: (1) get the participants to agree to pay for and locally implement a common standard and sourcing agreement to replace the existing babel; (2) impose standards and sourcing mandates externally and risk user resistance; (3) ignore standards and leave connectivity and translation up to each participant; or (4) centrally build many costly and cumbersome translating bridges among member systems.

Lessons Learned

Technical standards for hardware, software, data, and communications are essential elements of an effective interagency collaboration, yet in many instances the needed standards were either not yet in place or a consensus as to their value had not yet been reached. One challenge is that some technologies have multiple published standards from which to choose; in other cases, necessary standards were under development, yet participants needed to press forward with a solution. Inclusion of an IT standards expert on the project team is advisable where possible. Standards decisions can affect the ability of some agencies or business partners to participate in a collaboration, and an ill-considered choice can have long-term effects on the system's acceptance.

Sourcing decisions were also problematic for some organizations. The trade-offs between open source and proprietary code must be carefully evaluated, and the long-term consequences of the decision must be considered. This is a new twist on the make-versus-buy decision, since the flexibility and affordability of open source must be weighed against the dependability and availability of custom-developed or off-the-shelf software. In a pilot test, this choice may not be very consequential. However, for a system that is to roll out across many organizations, functions, and jurisdictions, the choice is complex and far-reaching.

Technical Challenges: Key Lessons Learned

1. Participants will share data far more readily than they will cede ownership of or control over access to the data.
2. Data-sharing issues are easier to address when data are owned, retained, and maintained by the originators.
3. Retaining data in a single location controlled by a single organization increases their accuracy and timeliness.
4. Tie-ins to legacy systems place limits on system architecture and on the ability to adopt state-of-the-art solutions.
4. Standards decisions can affect the ability of agencies or business partners to participate in a collaboration. Organizations that actively participated in standards development organizations were better able to weigh the trade-offs between customized versus standardized solutions.

Recommendations

Collaboration across agency boundaries is hard; there is no guaranteed recipe for success. These initiatives face challenges from within participating organizations, from within the governing organization, and from sources completely outside of the initiative. Decisions made about one aspect of an interagency initiative will affect its design or use in unexpected ways. Political enablers and constraints compete with administrative practices, organizational processes, and technological opportunities, resulting in complicated and sometimes sub-optimal design decisions for the technologies and processes participants will use. Although there is no one best way to design an interorganizational collaboration, we can offer some helpful hints that should improve the likelihood of success. We conclude with 10 recommendations for managers involved in e-government collaborations.

Recommendation 1: Create opportunities for collaboration out of crises and other precipitating events. Where a need exists, an effective leader can emerge and articulate a case for action. To articulate that need, effective leaders should be constantly vigilant for indications in the environment that point toward new needs and new solutions. The business press can help government leaders identify business solutions that could potentially be adapted to e-government needs. Technical publications can help leaders become aware of potentially useful tools to support collaboration solutions. And stakeholders in each leader's community are often excellent sources of information about problems, opportunities, and innovations. Don't wait for the crisis to unfold; find a way to make the case that an interagency collaboration can help to avoid a crisis or capitalize on an opportunity.

Recommendation 2: Establish a shared understanding of goals and objectives. Some collaborators come together to solve one problem and subsequently choose to address other problems or needs. While this can improve stakeholder buy-in, it also can raise the costs of participation. The purpose of an initiative and specific project goals should be re-assessed frequently to ensure that consensus still exists. Although a solid working relationship built on mutual trust is essential, it is also necessary to formalize relationships among participants through contractual agreements and a representative governing board or entity. The governance structure may need to expand over time to include new stakeholders, and agreements may need to be renegotiated or amended.

Recommendation 3: Cultivate a team of champions. Interagency collaborations are fragile entities; at any turn, a roadblock may emerge and events can rapidly spiral downward when many different stakeholders are all attempting to achieve something together. An interagency initiative needs multiple champions—for the overall collaboration, for each of the participating organizations, and for the different levels of involvement and the different challenges that occur over time.

Recommendation 4: Assess readiness and facilitate participation in the collaboration. A small town sheriff's office and a large metropolitan police force are worlds apart in their internal information systems, employees, controls, and organizational histories, yet both may have reason and ability to participate in interagency initiatives. It is not always disastrous if one potential participant opts out of the collaboration, but sometimes one reluctant participant could be the missing link that

renders an interorganizational system ineffective. If system success hinges on attaining a critical mass of participating users, then the collaboration leaders need to find efficient ways of qualifying participants or providing them with the training and resources needed to come on board.

Recommendation 5: Leverage opportunities to combine data from multiple sources within the boundaries of social expectations. Great value can be created when data from multiple sources are combined. However, combining sensitive data sources may trigger citizens' fears that government is invading their privacy. Cross-boundary access methods are far more difficult to administer than in-house ones. It is imperative that interagency collaborations establish appropriate controls to protect access to the data and prevent misuse. Conduct audits of an interorganizational system on a regular basis to ensure that its controls are effective. The penalties for data misuse should be widely publicized and systematically enforced.

Recommendation 6: Develop a business model for long-term viability. The arguments and evidence that persuaded funders to contribute to a unique initiative in the immediate aftermath of a crisis or mandate may be much less persuasive later on, particularly when critics question why the initiative still is not self-supporting. To paraphrase strategic management consultant Michael Porter, find your path to profitability and march on down it. In practical terms, this means fully identifying all of the costs: to initially design and develop a working system; to maintain and enhance it over time; and to fund the ongoing operational costs once that critical mass of users is on board. It also involves identifying an initial set of benefits that can be realistically achieved, followed by continuous monitoring of actual usage to uncover hidden benefits, and then helping participants get and see those benefits so they will be willing to share the operating costs.

Recommendation 7: Understand—in detail!—how data are to be exchanged and used. If data need to be acted upon within minutes, they are managed differently then if data are needed once a month. Security and privacy constraints often dictate what can be shared and with whom. Collaborators need to recognize that there are always trade-offs among the competing data qualities of timeliness, accuracy, and completeness. It is necessary to clearly specify who will retain stewardship of the authoritative version of various databases, what steps will be taken to protect the data, and what remedies and penalties will be put in place should parties fail to comply with these requirements.

Recommendation 8: Consider leading-edge technologies, but accept the legacy reality. Every IT manager wants to use the latest and greatest technologies, because they open the door to faster, more flexible, and more data-rich collaboration. However, given that it is so expensive to retire a legacy system, it may be easier to provide manual workarounds or to write special data-sharing translators. The translator option is preferable, unless the initiative is a short-term pilot test or the manual workaround is a one-time event (such as when archived data are supplied by one organization to another).

Recommendation 9: Solicit many informed opinions on what software tools to use, and choose them carefully. Open-source software is an appropriate choice for organizations that have adequate technical depth, but it can be a disastrous decision if the

Recommendations for Successful E-Government Collaboration

1. Create opportunities for collaboration out of crises and other precipitating events.
2. Establish a shared understanding of goals and objectives.
3. Cultivate a team of champions.
4. Assess readiness and facilitate participation in the collaboration.
5. Leverage opportunities to combine data from multiple sources within the boundaries of social expectations.
6. Develop a business model for long-term viability.
7. Understand—in detail!—how data are to be exchanged and used.
8. Consider leading-edge technologies, but accept the legacy reality.
9. Solicit many informed opinions on what software tools to use, and choose them carefully.
10. Adhere to standards and, if possible, help set them.

choice is based merely on the initial cost of the software. Software or tools that are donated by vendors may not be all they seem or may not be adequate to the tasks at hand. Obtain outside expertise to walk through the total-cost-of-ownership issues before selecting hardware and software. An interorganizational system is harder to manage when its architecture is not coherent.

Recommendation 10: Adhere to standards and, if possible, help set them. Project leaders should consider the short- and long-term implications of adopting particular standards. Initiatives will be more successful if standards already exist in use or are agreed to by participants. If different participants support competing standards, challenges increase. The collaboration may choose to impose a single standard on its users, or choose to expend resources on the development of middleware to translate among them. Furthermore, adopters must be prepared for the evolution or replacement of standards. If possible, the development team should include standards experts on the team. The next best choice is to obtain outside expertise to review standards-related issues across all of the hardware, software, and communications technologies that are proposed or in use. Do not leave standards decisions to either general managers or programmers, who may not fully understand the implications of their choices.

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Appendix: Assessment Criteria

Table A.1: Assessment Criteria for Analysis of Case Data

Dimension	Aspects	Definition
Political	Catalyst	• Preparatory events that provide experience and develop relationships among key participants of prior collaborations • Precipitating events, including a highly visible disaster or system failure, that help to spawn a collaboration or propel it forward
	Champions	• Financial, organizational, political, or technical supporters who are strategically placed within participating organizations, the collaboration, its stakeholders, and external power brokers
	Legal/regulatory requirements	• Legislative and regulatory requirements that serve either as an incentive (or catalyst) to a collaboration or constrain its implementation
Administrative	Governance	• Organizing agreements and structures (boards, steering committees, etc.) that establish and formalize the relationships among participants • Initial and revised vision and goals of the collaboration, which evolve as the system matures and new participants join
	Process and implementation issues	• Changes that are required in organizational processes and relationships to support the collaboration • Implementation efforts such as training, staffing, and change management
	Financing	• Soft funding or targeted operational budget line item to pay for the design and implementation of a prototype, beta version, or Version 1.0 of the initial system • Viable long-term plan for sustaining the financial and operational success of the collaboration
Technical	Legacy systems	• Presence of aged applications or databases that constrain the design or capabilities of the collaborative system
	Data management	• Decisions regarding data sources, data definitions and comparability, ownership and replication rights and restrictions, access rights and restrictions, privacy controls, and stewardship
	Standards and sourcing criteria	• Decisions regarding de jure or de facto standards for communication, security and access methods, data, and devices • Decisions regarding adoption of open-source or commercial software for back-end and user-facing technologies

Source: From project documents, websites, and interviews conducted with participants.

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