Interim Report

State-level HIE Value and Sustainability:
Approaches for Financing & Bringing Interoperable HIE to Scale

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I. EXECUTIVE SUMMARY

Overview
Numerous studies have demonstrated that the effective use of health information technology (IT) and the ability to securely share patient information can significantly improve the safety, quality, and efficiency of health care.[1] Accordingly, stakeholders at the federal, state, and local levels are working to develop and implement the policy, technical, and financial strategies to accelerate the deployment of health IT tools that support and communicate through interoperable health information exchanges (HIEs).

Federal HIE efforts have focused on national policy coordination, standards, product certification, privacy and security, and demonstration projects, leaving the acquisition, implementation and operation of the networks to be driven by market forces. At the state level, multi-stakeholder collaborations have emerged to stimulate health IT adoption and advance interoperable HIE.

Consistent with traditional state health roles and accountabilities (e.g., public policy, consumer protections, regulatory oversight, public programs), public-private collaborations are emerging as important points of organization and leadership for HIE development. In more than three-quarters of the states, state-level HIE initiatives are providing resources, sponsoring statewide road maps for HIE development, and codifying HIE functions within their legislative, regulatory, and rule-making frameworks.

Facing complex technology options, challenging fiscal climates, and competing and dynamic interests across the public and private sectors, state-level HIE efforts need support in developing their policy infrastructure, technical approaches, and investment strategies to ensure that the evolving networks serve the collective needs of all stakeholders.

Value and Sustainability Research
The State-level Health Information Exchange (HIE) Consensus Project (Project) provides knowledge and a network of experts to support development of effective state-level HIE efforts. Since 2006, the Project has studied and reported on how HIE implementation is occurring across states. The Project continues to analyze and assess HIE governance and the key roles and functions occurring at the state-level through defined public-private partnerships.[2]

In March 2008, the Project launched a new phase of research to understand prevailing state-level HIE business models, the value propositions behind particular approaches to interoperability, and the implications of financing options for the pace, timing, and prioritization of implementation decisions regarding technical architecture, HIE services and governance.

In the midst of a worsening nationwide fiscal environment, state-level HIE initiatives face intensifying financial challenges as they strive to develop and sustain their efforts to advance interoperability.

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[1] An annotated inventory of studies documenting the value of health information exchange can be found online at http://www.slhie.org/Docs/Inventory.xls.
[2] Additional information on Project, including links to previous reports, presentations, and ongoing research projects is available online at http://www.slhie.org/.

To help stakeholders optimize the organization and implementation of their state-level HIE efforts, the Project's latest phase of research focused on the following questions:

- What are the prevailing models for implementing statewide HIE? What circumstances or factors influence decisions regarding state-level HIE implementation? What are the sequence, timing, and duration of the key activities?

- How is state-level HIE value defined? What are the value propositions for the key components of statewide interoperability?

- What are the measures of success that state-level HIE projects are using? How are value and benefits being assessed and tracked?

- What are the available financing models for implementation and ongoing operations?

- Who is financing state-level HIE? What are their expectations and value propositions?

- How do statewide plans blend the financing options, governance models and technical implementation approaches?

- How do financing options affect and influence the pace, timing, and prioritization of implementation decisions, technical models, and use cases?

Based on field research of leading state-level HIE initiatives and an analysis of HIE financing strategies, this report will help decision-makers at the both the federal and state levels assess the range of alternatives and develop implementation models for achieving full interoperability that take into account the collaborative opportunities and the competitive dynamics of the market place.

Key Findings

- Interoperable HIE exhibits public good characteristics and, as such, requires collective public-private approaches to ensure the optimal pace and scale of implementation.

- The ability to finance, develop, and sustain state-level HIE efforts requires the creation of a state-level HIE governance and policy framework. A predictable, transparent, and inclusive statewide framework of trust and accountability provides the best mechanism for determining stakeholder needs, navigating competing and divergent interests, and differentiating value propositions and proportional investments. In states like Delaware, Rhode Island, Maine, New York, Tennessee, and Vermont, financing has resulted from stakeholders' participation and confidence in the governance mechanisms that have been established to guide state-level HIE.

- Achieving widespread interoperability is inextricably linked to an agenda for transforming health care to improve quality and foster cost-effectiveness. States with explicit and strong commitments to leverage HIE as part of their broader health care agendas have had the most success to date in financing and implementing state-level HIE initiatives.

- In even the smallest states, facilitating statewide interoperability is a complex, multi-year proposition that requires durable sources of capital with a long-term focus.

- With limited federal support for implementation, the uncertainty of annual appropriations, and the challenges of securing private sector capital, the most viable approaches for financing state-level HIEs infrastructural capacity have been state governments' capital budgets, special purpose funds, and assessments.

- In order to reduce risk and overall costs, state-level HIEs are aggressively pursuing implementation strategies for scaleable architectures and shared infrastructure across multiple data providers and consumers. Commensurate with these strategies is the need for state-level HIEs initiatives to have the capacity, resources, and skills to understand their customer's needs and navigate the challenges of competing and divergent interests.

II. PROJECT OVERVIEW

Research Scope

In response to the challenges of developing and financing state-level HIE initiatives, the Project launched its current phase of value and sustainability research in March 2008 to identify and assess:

1. the characteristics and implications of advanced state-level HIE efforts,

2. the value proposition and key financing considerations for state-level HIE efforts, and

3. the financing options and their influence on the nature, pace, and timing of state-level HIE implementation

Research Methodology

As a first step, the research team developed an analytic framework to assess the financing options to launch and sustain state-level HIE. Vetted by a group of national experts, the analytic framework identifies the range of funding sources, mechanisms, recipients, and revenue sources for financing state-level HIE.
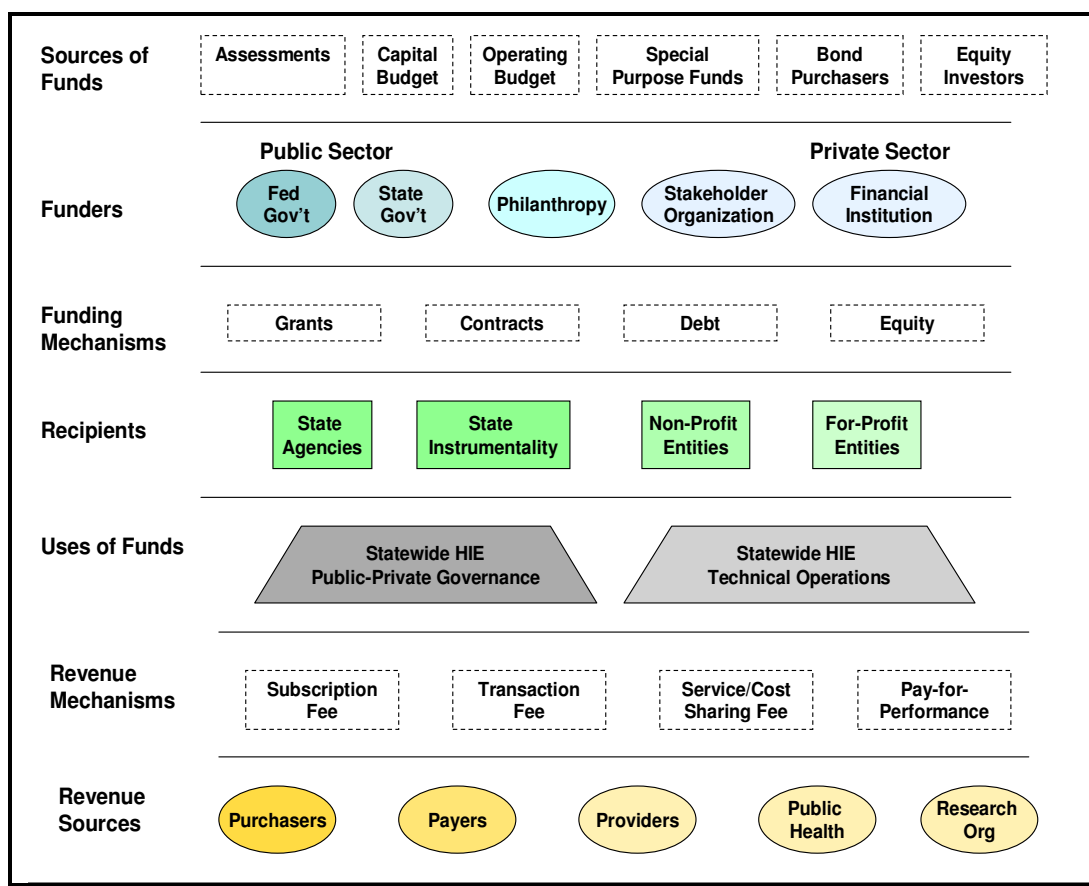
Illustration 1: State-level HIE Financing Analytic Framework

Definitions of the financing components and other key elements of state-level HIE can be found in *Attachment 1*.

Through this analytic lens, the researchers reviewed leading state-level HIE efforts in order to determine the relationships between start-up funding, the use of funds to support implementation, and approaches for sustainability. From July through September 2008, researchers conducted telephone interviews with leaders from fifteen emerging and advanced state-level HIEs regarding their financing and implementation strategies. Lists of contributors, respondents, and advisors are provided in *Attachment 2*.

III. CONSIDERATIONS FOR STATE-LEVEL HIE VALUE AND FINANCING

Numerous studies have shown that the secure, timely and accurate exchange of health information can improve the quality, safety, and efficiency of health care.[3] Recognizing the potential value of HIE to serve as the foundation for health care transformation, stakeholders at the national, state, and local levels and across the public, non-profit and private sectors are working together to develop plans, align resources, and invest funds to advance the interoperable exchange of health information.

Federal Strategy
The federal government, through the Department of Health and Human Services Office of the National Coordinator for Health IT (ONC), has defined a national strategy around four core functional components: (1) policies relating to privacy and security; (2) standards, networking, and interoperability; (3) adoption of technology and information use; and (4) collaborative governance and decision-making.[4] The functional components have been supported by a multi-level investment strategy.

At the national level, the federal government has funded policy coordination, privacy and security, technical standards and certification, and demonstration projects. While the federal focus has been on the policy levers to advance health IT and HIE, the responsibility of implementation has largely fell to stakeholders at the state, regional, and local levels.

Development of HIE Marketplace
In the absence of federal financing framework and widespread reimbursement reform, HIE has grown slowly and has been primarily organized to meet the immediate interests and near-term operational requirements of a limited set of stakeholders.[5] For example, the most advanced and sustained clinical HIE efforts, including HealthBridge, THINC RHIO, and the Indiana Health Information Exchange (IHIE), successfully built systems around the transactional needs of data providers by supporting the automated exchange of clinical results between hospitals, community-based physicians, and independent national laboratories.

These "private exchanges," where organizations with defined business relationships share information to address internal needs, are proliferating and will likely accelerate as health care organizations expand their IT capabilities for strategic advantage and marketplace differentiation vis-à-vis their competitors. A recent study of hospitals' support for physician acquisition of EHRs demonstrates the appeal and growth of private exchanges.[6]

Remaining keenly attentive to their paying customers' priorities, the private exchanges aren't designed to address the objectives of the broader health care community. As a result, public health surveillance, access for providers in rural or underserved communities, and quality reporting are often relegated to second tier priorities.

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[3] An inventory of studies documenting the value of HIE is online at http://www.slhie.org/Docs/Inventory.xls.
[4] US Department of Health and Human Services, ONC. "Federal Health IT Strategic Plan: 2008-2012." June 3, 2008. Available online at http://www.hhs.gov/healthit/.
[5] Glaser, John, "The Advent of RHIO 2.0," *Journal of Health Information Management*. Summer, 2007.
[6] Grossman, JM., Bodenheimer, TS, McKenzie, K. "Hospital-Physician Portals: The Role Of Competition In Driving Clinical Data Exchange," *Health Affairs*, November/December 2006.

Contributions of State-level HIE

Recognizing the potential for creating a shared infrastructure that meets the collective needs of all stakeholders, state-level HIE initiatives are advancing interoperable HIE. In nearly three-quarters of states, policy makers are fostering state-level HIE by providing resources, sponsoring statewide road maps for HIE development, and codifying state-level HIE functions within legislative, regulatory, and rule-making frameworks.

These efforts highlight an important distinction between "states" and "state-level HIE." The term "states" refers to the roles and responsibilities of state government including health care policy, regulation and oversight, public health, and public insurance programs. "State-level HIE" refers to organized state-level efforts involving public and private stakeholders that serve as the locus for organization, planning, and implementation of statewide interoperability efforts.

State-level HIEs offer distinct contributions to advance the interoperable exchange of health information:

- Ensure that exchange develops beyond narrowly-defined interests to serve all state stakeholders and their data needs.

- Identify the boundaries for cooperation and competition and mobilize public and private resources for effective collaboration.

- Create opportunities for cost-effective, shared investments across stakeholders.

- Serve state public policy interest and consumer protection concerns by facilitating consistent, reliable HIE practices.

Previous research has shown that state-level HIE initiatives provide a range of functions and tasks organized around two distinct roles:

- *Governance*: A primary role to convene health care stakeholders, promote collaboration, develop consensus, coordinate policies and procedures to secure data sharing, and lead and oversee statewide HIE.

- *Technical operations*: An optional and variable role to manage and operate the technical infrastructure, services, and/or applications to support statewide HIE.

Role	Governance		Technical Operations
Functions	*Convene*	*Coordinate*	*Operate/Manage*
Tasks	• Provide neutral forum for all stakeholders • Educate constituents and inform HIE policy discussions • Advocate for statewide HIE • Serve as an information resource for local HIE and health IT activities • Track/assess national HIE and health IT efforts • Facilitate consumer input	• Facilitate alignment with statewide, interstate, and national HIE strategies • Promote consistency and effectiveness of statewide HIE policies and practices • Support integration of HIE efforts with other health care goals, objectives, and initiatives	• Own or contract with vendor(s) for the hardware, software, and/or services to conduct HIE

Bringing State-level HIE to Scale

Developing and sustaining efforts to bring interoperability statewide requires state-level HIEs to address an array of interrelated policy, technical and financial issues. In an effort to coordinate resources to address these challenges, a number of states have developed roadmaps that define discrete stages, measurable milestones, and the forecasted pace of implementation.[7]

In Minnesota, the state-level HIE, the Minnesota eHealth Initiative, calibrates its activities to a staging model developed by the eHealth Initiative as depicted by the illustration below.[8]
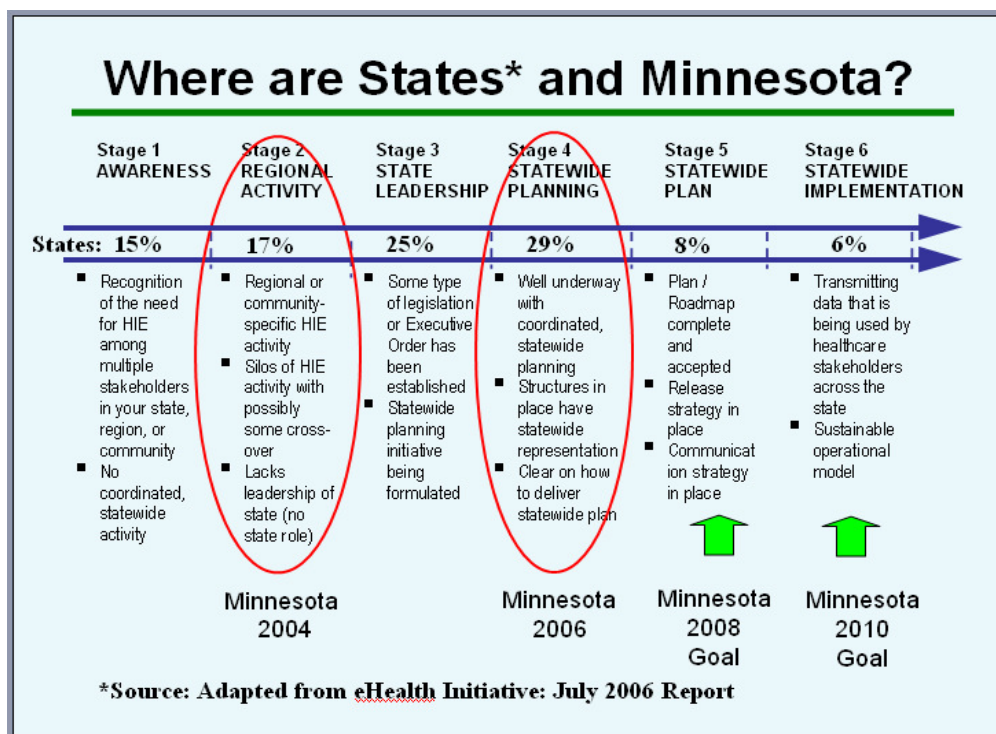
Minnesota's state-level HIE implementation timeline

In order to understand the timing and sequence of activities across various implementation models, the research team conducted an analysis of 27 publicly available state-level HIE roadmaps. The research team found that four stages were consistently expressed across a range of state-level HIE implementation models:

Stage 1.   *Formative*: An awareness stage. State-leadership recognizes the need for health IT and/or HIE in the state.

Stage 2.   *Foundational*: Entity, initiative, or advisory body with statewide purview has begun deliberations and planning for governance, financing, and technical components is underway.

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[7] An inventory of state-level HIE roadmaps, plans, and designs can be found via the Project website at http://www.slhie.org/Docs/CategorizationOfStateHIEPlansRoadmapsReportsRFPs.xls

[8] *Accelerating e-Health in Minnesota: 2007 Minnesota e-Health Initiative Report to the Minnesota Legislature*. Minnesota Department of Health (January 29, 2007). Available online at http://www.health.state.mn.us/e-health/legrpt2007.pdf.

Stage 3. ***Implementation***: (1) key roadmap implementation steps have been undertaken; (2) pilot projects underway.

Stage 4. ***Operational***: A fully functioning state-level HIE is fulfilling all the required governance and/or technical operation roles and conducting exchange of clinical data.

Details on the governance, finance, and technical elements across the four stages are provided in *Attachment 3*.

While there is great interest in tracking progress against a defined implementation schedule, only a few state-level HIEs have created detailed timelines.[9] Based on an assessment of the publicly available roadmaps in 25 states, nine state-level HIE initiatives have publicly defined an overall implementation timeframe, with the average duration being five years.[10] A number of state-level HIE representatives indicated that creating detailed timeframes should recognize and accommodate the uncertain and often uneven pace of defining priorities and achieving consensus through inclusive, transparent collaboration processes. A comparison of state-level HIE implementation frameworks and timelines is provided in *Attachment 4*.

As state-level HIEs continue to mature, additional details on the characteristics, optimal sequence, and anticipated duration of key activities are needed to understand the viability of various models and set more precise expectations regarding implementation.

Defining Goals

The success of state-level HIEs as they advance along their implementation paths will be based on their ability to realize their objectives and deliver demonstrable value. As part of their roadmaps and business plans, state-level HIEs are identifying objectives and developing mechanisms to gauge progress toward their articulated goals.

Most state-level HIEs define their goals in the context of improving the quality of care. Based on a review of publicly available mission statements, 16 of 21 state-level HIE efforts identified the pursuit of statewide interoperability for quality and value as their core objective. The Minnesota e-Health Initiative's vision statement, provided below, is typical of many state-level HIEs:

> *The vision of the Minnesota e-Health Initiative is to accelerate the use of health information technology to improve healthcare quality, increase patient safety, reduce healthcare costs, and enable individuals and communities to make the best possible health decisions. The Minnesota e-Health Initiative focuses on four areas:*
>
> • *Empowering consumers with the information they need to make informed health and medical decisions.*

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[9] A recent study by the State Alliance for eHealth found that most state's lack formal state-level roadmaps and the existing roadmaps need to be updated to reflect the full range of issues and emerging challenges. *Accelerating Progress: Using Health Information Technology and Electronic Health Information Exchange to Improve Care*. State Alliance for eHealth (September 2008). Available online at http://www.nga.org/Files/pdf/0809EHEALTHREPORT.PDF.

[10] A number of state-level HIE initiatives interviewed for this research indicated that their implementation timelines were either in development or were part of internal business plans documents that were not currently available to the public.

- *Informing and connecting healthcare providers so they have access to the information they need.*

- *Protecting communities with accessible prevention resources, and rapid detection and response to community health threats.*

- *Enhancing the infrastructure (technical, information, education, privacy and security policies, and financial resources) necessary to fulfill the Minnesota e-Health vision and focus.*

Against these broad parameters, a few state-level HIEs have developed more granular objectives and measures. In Oregon, the state-level HIE governance entity, the Health Information Infrastructure Advisory Council (HIIAC), utilizes a logic model built around inputs, processes, and outcomes to identify the activities and delineate milestones and anticipated results for the statewide HIE activities.[11]

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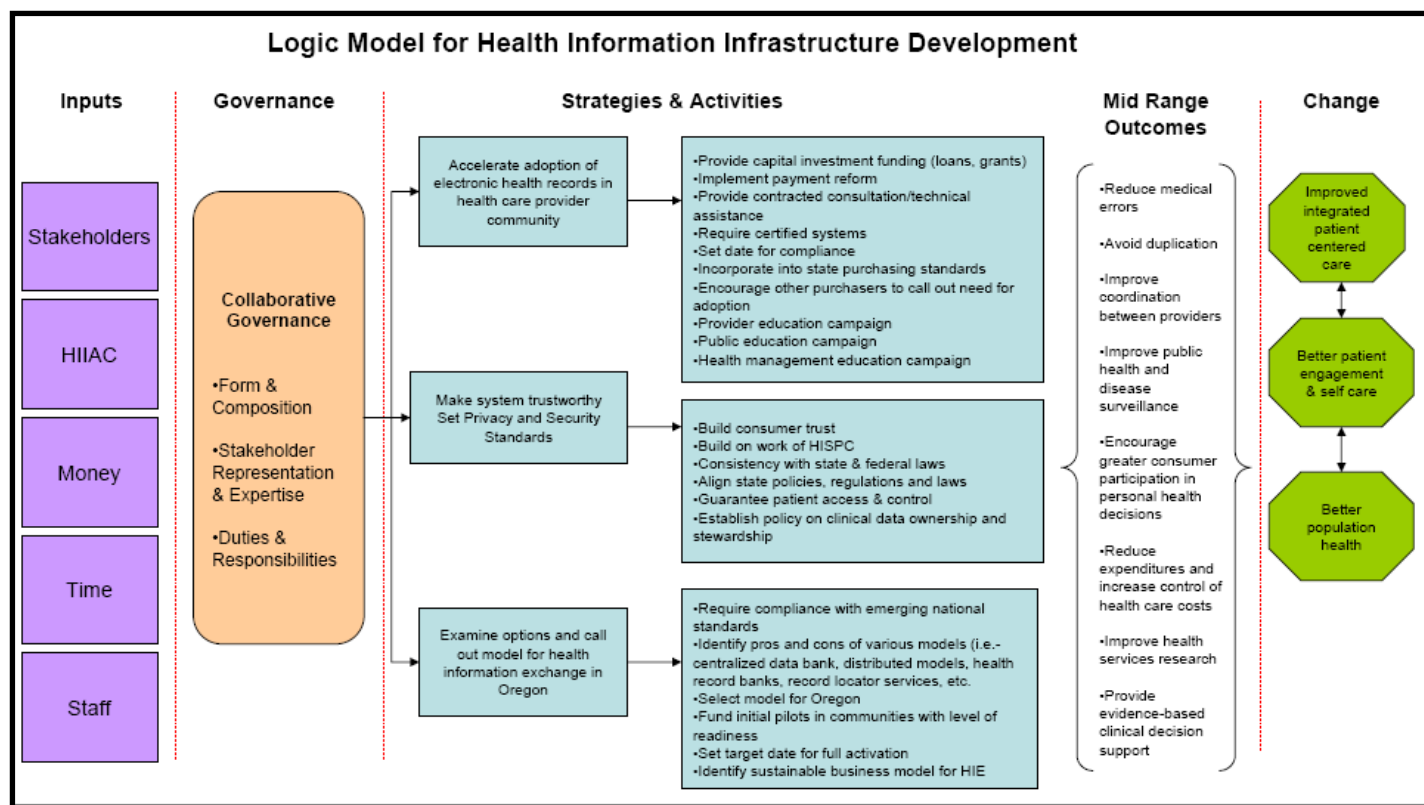
[11] Health Information Infrastructure Advisory Committee (HIIAC) Meeting Notes for Thursday, June 19, 2008. Available online at http://www.oregon.gov/OHPPR/HIIAC/MeetingMaterials.pdf.

Measuring State-level HIE Progress
Developing performance metrics to assess the impact of state-level HIE is an area of intense interest for funders, stakeholders, and participants.[12] Recognizing that most HIE efforts lack the skills and resources to build and conduct rigorous evaluations, the federal government and a handful of state-level HIE initiatives have launched programs to support HIE research efforts.

The US Department of Health and Human Service's Agency for Health Care Research and Quality (AHRQ) maintains an "Evaluation Toolkit for Data Exchange Projects."[13] As part of its multi-year contracts for state and regional HIE demonstration projects, AHRQ is also working with its awardees to identify common progress and evaluation measures that can be used across a range of projects.

At the state-level, Delaware, Minnesota, and New York are committing resources to assess value and measure progress.

- The Delaware Health Information Network (DHIN) has established specific project-related and overall performance metrics that have been designed to ensure the return on investment for all stakeholders.

- As required by its authorizing legislation, the Minnesota e-Health Initiative provides an annual update on its progress to the Minnesota legislature. In 2007, the Minnesota e-Health Initiative's *Annual Report to the Legislature* included a report card on its progress against key activities and the nature and amount of public sector funding.[14] An illustration of the Minnesota e-Health Initiative's reporting framework is provided on the following page.

- In March 2008, the New York Department of Health awarded a two-year, $5 million contract to the Health Information Technology Evaluation Collaborative (HITEC) to assess and develop evaluation instruments for interoperable health information exchange and EHR adoption across the State.

Owing to the nascent state of HIE development, identifying measures that can be consistently applied across the varied HIE implementations and stakeholders has been a challenge. Research respondents expressed optimism that, as the number of HIE efforts conducting data transactions grows, more will be known regarding the validity and viability of measures to track HIE progress and determine the impact on the quality of care.

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[12] Two reports of note include: (1) Labkoff, S. and Yasnoff, W. "A framework for systematic evaluation of health information infrastructure progress in communities." *Journal of Biomedical Informatics*. Feb 2006; and (2) Hripcsak G, Kaushal R, Johnson KB, Ash JS, Bates DW, Block R, Frisse ME, Kern LM, Marchibroda J, Overhage JM, Wilcox AB. "The United Hospital Fund meeting on evaluating health information exchange." *Journal of Biomedical Informatics* (August 2007).
[13] AHRQ's HIE Evaluation Toolkit is available online through the National Resource Center for Health Information Technology at http://healthit.ahrq.gov.
[14] Available online at http://www.health.state.mn.us/e-health/legrpt2007.pdf.

Table 3. MN e-Health Advisory Committee Recommendations for Action

Summary of Themes and Recommendations for Action Needed to Advance the Statewide Implementation and Use of HIT	Relates to				Proposed Public Funding†	Status Statewide†† (1 Low–4 High)
	Inform practice	Interconnect Care Providers	Personalize care	Improve public health		
Empower Consumers						
1. Accelerate the availability and use of accessible, portable "My Personal Health Record," with priority given to:						
1a. "My Preventive Health Information" (immunizations, well child screenings) for children and adolescents;			✔	✔	◗ (Considerable)	2
1b. "My Medication and Health History Information" ("My Clipboard") for all individuals; and			✔	✔	◖ (Little)	1
1c. "My Care" management tools for individuals with chronic disease (diabetes, asthma, heart disease, cancer).			✔	✔	◖ (Little)	1
Inform and Connect Healthcare Providers						
2. Fund and implement interconnected health information technology statewide, focusing on secure health information exchange in the following priority areas:						
2a. Continuity of Care Records, through secure and timely exchange of patient health histories;	✔	✔	✔		○ (No use)	1
2b. e-Prescribing;	✔	✔	✔		◖ (Little)	2
2c. Shared information for improved chronic disease management;	✔	✔	✔	✔	◗ (Considerable)	2
2d. Accessible, complete laboratory result reports with the interpretation of the results; and	✔	✔		✔	◖ (Little)	1
2e. Fully integrate bi-directional immunization data exchange between the registry and EHRs, with centralized decision support from the registry.	✔	✔	✔	✔	◓ (Considerable)	3
Protect Communities						
3. Improve population health and protect communities through accessible prevention resources, widespread knowledge of community risks, and rapid detection of and response to public health threats, including to:						
3a. Improve the timely detection and electronic reporting of diseases to public health authorities, with timely return of information on community risks and threats.	✔			✔	● (Significant)	1
3b. *Create and support an integrated state-local Minnesota Public Health Information Network (MN-PHIN) for timely detection of and response to infectious disease and other emergencies.	✔	✔	✔	✔	● (Significant)	1

†Proposed Public Funding
● = Significant or full reliance on public funding   ◓ = Considerable reliance on public funding
◖ = Little reliance on public funding   ○ = No use of public funding

††Status of Statewide Progress on this Recommendation (estimate)
1 = Not started or very limited progress   3 = Widespread progress
2 = Some progress   4 = Statewide achievement of recommendation

IV. PREVAILING PATHS TO STATEWIDE INTEROPERABILITY

Regardless of the landscapes in which they find themselves, state-level HIEs must navigate the expectations and sometimes competing interests and priorities of multiple stakeholders. As they pursue interoperability, state-level HIEs are building governance and technical frameworks that facilitate the sharing of HIE services across data providers and consumers.

Creating Governance Mechanisms to Align Stakeholders and Build Trust
Previous Project research revealed the need for consistent and defined governance functions that serve each state.[15] To serve broad public policy goals, state-level HIEs strive to represent the interests of both private and public data stewards and data-sharing beneficiaries. Emerging state-level activity demonstrates the leverage that can be applied by state governments, acting in partnership with a state-level HIE governance entity, to advance strategies for HIE adoption. By empowering a single state-level HIE governance entity with recognition, accountability, and funding, state government can create incentives for participation in state-level HIE efforts.

Study informants indicated that an organization seeking to provide statewide HIE roles needs distinct recognition or authority to serve in these capacities. Such empowerment is seen as important for the channeling of resources to sustain key functions and to signal stakeholders about the importance of engagement. States in early developmental stages have used a variety of approaches to establish leadership and initiate state-level HIE efforts. As they pursue such functions as facilitating consumer protections, compliance with federal and state laws and regulations, and best practices related to privacy and security, state-level HIE efforts need more formal defined empowerment and related accountabilities.

State-level HIE initiatives have employed a variety of means to establish standing as an entity or effort whose responsibilities extend statewide either temporarily or permanently.[16] State government, charged with the regulatory and policy means to serve the interests of the state, have conferred authority to state-level HIEs by identifying them in gubernatorial executive orders, legislation, agency regulations and rules, or contracts to serve in a certain capacity or perform specified tasks (e.g., privacy assessment, technical implementation).

In addition to these traditional sources of authority, a number of state-level HIE efforts have secured alternative means of recognition. For example, gubernatorial campaign platforms and state agency policy briefs have been used effectively to confer recognition on state-level HIE efforts.

State-level HIE representatives emphasized that sources of authority and the mechanisms used to confer authority are heavily influenced by local practices and practical considerations. For example, the degree to which state governments use executive orders, rules and regulations, and contracts varies significantly from state to state and across administrations in each state.

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[15] *State Level Health Information Exchanges Initiative: Development Workbook.* AHIMA/FORE (March 1, 2008). Available online at http://www.slhie.org/reports.asp.
[16] For additional details on indices of statewide authority, please see *State Level Health Information Exchanges Initiative: Development Workbook* Appendix C - Profiles of State-Level HIE: Sources and Mechanisms for Statewide Authority. Available online at http://www.slhie.org/Docs/Appendices.10.pdf.

Some early state-level HIE governance efforts are being incubated by government agencies and personnel. However, the organizational model being implemented in many cases and viewed as most viable in the long term is the state-level HIE as an independent public-private partnership. This legal structure is perceived as ultimately necessary to ensure a state-level HIE's effectiveness, including freedom from variable political agendas and flexibility to work effectively with a wide range of stakeholders. As a transparent, independent, and inclusive entity, state-level HIEs can serve as a trusted and neutral source of leadership and governance and to operate in an entrepreneurial role vis-à-vis building statewide HIE capacity.

Developing Frameworks for Shared Technical Services
A key component to building the technical framework to advance interoperability is the recognition that state-level HIEs offer the potential to create and leverage shared services across a wide range of stakeholders. Use of IT in other industries demonstrates that shared services, when implemented correctly, can:

- create a customer orientation,
- provide process rationalization, repeatability and predictability,
- reduce redundancy and complexity, further reducing costs and improving reliability, and
- improve the use of scarce, often expensive, resources.[17]

In their attempts to define and support the blended value proposition for a shared infrastructure, representatives from state-level HIEs described the following challenges:

- **Clarifying Objectives**. The technical infrastructure should be driven by the statewide health care objectives and priorities. In order to first define and rank the goals and then build the necessary consensus to support implementation, state-level HIE efforts require governance structures, stakeholder participation, and dedicated resources.

- **Defining Shared Services**. State-level HIEs must identify core services and functions that are valued across a wide range of stakeholders and don't pose disruptive or competitive challenges to existing and planned systems. In this regard, the experiences of successful HIEs at regional levels may provide valuable lessons to state-level HIEs.

- **Selecting and Prioritizing Technical Services**. State-level HIEs often face difficult decisions between supporting near-term HIE solutions and investing in services that would advance the longer term goals of full interoperability. In evaluating their options, state-level HIE efforts seek to maximize value vis-à-vis the costs for creating systems to support statewide interoperability. State-level HIEs typically assess candidate services across the following criteria: (1) the clinical value generated, (2) the degree of competition for the service, (3) the breadth and depth of potential clients, (4) anticipated net revenue and return on investment, (5) technical difficulty; and (6) vendor interest, capabilities, and costs for service provision.

- **Addressing Bundled Services**. Some of the services that would be potential candidates to be offered as shared services are part of vendor's bundled technical and pricing package. Accordingly, vendors may be reluctant to unbundle their products and risk losing any financial benefits and leverage associated with providing those services.

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[17] *What Every IT Leader Should Know About Shared Services.* Gartner (August 2005). A summary of the report is available online at http://www.gartner.com/resources/130100/130122/what_every_it_l.pdf.

- **Selecting Vendors**. HIE infrastructural services (e.g., Master Patient Index, Record Locator Services, data normalization, authentication) and applications (e.g., EHRs, PHRs, electronic prescribing, reporting tools) vary dramatically in their capabilities, performance, reliability, and costs. While state-level HIEs continue to use Requests for Proposals to assess vendor products, the variability of platforms and offerings makes price/performance evaluations challenging.[18]

- **Mandated or Optional Participation**: State-level HIEs should consider whether entities operating in the state will be required to participate in the state-level HIE or whether they will have the ability to opt out of using the service.[19] While it is desirable in terms of consistency and shared costs for all entities to subscribe to the statewide service, a mechanism for addressing exceptions may need to be considered.

Technical Pathways for Bringing State-level HIE to Scale
While the promise of shared services is widely embraced, the options for bringing full interoperability to scale vary and are influenced by the configurations of health care providers, purchasers, payers and supporting organizations, which can vary significantly from state to state. Moreover, each state poses a range of existing and emerging exchange networks that state-level HIEs must contend with, including local exchanges, integrated delivery networks, aggregators of data for public health and quality purposes, clearinghouses, disease registries, regional and national data processors, and Chartered Value Exchanges.

In these complex environments, state-level HIEs struggle to array resources and prioritize technical implementation. Though approaches continue to evolve and adapt to changing conditions, three broad technical alternatives are emerging to achieve statewide interoperability:

(1) an approach focused on the creation of a centralized technical infrastructure that directly links all health care entities;

(2) a model reliant on Regional Health Information Organizations (RHIOs) as governance entities overseeing the implementation of common HIE policies, standards, and protocols;

(3) a network of "health record banks" through which patients' directly control access to their health information.

Each model is described in greater detail below, and it is important to note that while some state-level HIEs can be categorized into one of the three alternatives, others are blending elements of all three and adapting the models to suite their specific circumstances.

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[18] A catalogue of publicly available Requests for Proposals (RFPs) for State-level HIE activities is available online at http://www.slhie.org/Docs/CategorizationOfStateHIEPlansRoadmapsReportsRFPs.xls.
[19] A handful of states, including Minnesota and Massachusetts, have established mandated timeframes for the *use* of certain health IT capabilities (e.g., electronic health records, electronic prescribing, CPOE). However, no state has currently mandated stakeholder *participation* in an HIE.

Centralized technical infrastructure to connect health care entities
A number of state-level HIEs are developing centralized technical approaches designed to create a common infrastructure that minimizes the number of interfaces for data providers and users, and thereby may reduce overall development costs for statewide interoperability.

When operating in a single or relatively few distinct medical trading areas, a state-level HIE efforts contend with less RHIOs and HIEs. With a more manageable volume of stakeholders and recognizing opportunities for economies of scale, state-level HIE initiatives in Vermont, Delaware, Rhode Island, Maine, and Utah have organized their efforts around a single, designated entity that combines both the governance and technical operations functions. The Table below highlights the technical objectives of state-level HIEs in less populous states.

State	Population Estimate[20]	State-level HIE Initiative	Technical Implementation Goals
Vermont	621,254	Vermont Information Technology Leaders	• ***Phase 1***: Medication histories to Emergency Departments • ***Phase 2***: Chronic Disease Management
Delaware	864,764	Delaware Health Information Network	• ***Phase 1***: Clinical results/reports delivery & Public Health reporting • ***Phase 2***: Med and patient histories, eOrders, patient portal, enhanced Public Health reporting • ***Phase 3***: Physician workflow management and administrative functions
Rhode Island	1,057,832	Rhode Island Quality Institute	• ***Phase 1***: Medication and lab histories via secure, Internet-based portal • ***Phase 2***: TBD
Maine	1,317,207	HealthInfoNet	• ***Phase 1***: Patient ID & demographics, encounter histories, lab and radiology results, patient consent management via secure, Internet-based portal • ***Phase 2***: Adverse reactions/allergies, medication history, diagnosis/conditions/problems, dictated/transcribed Documents
Utah	2,645,330	Utah Health Information Network	• ***Phase 1***: Administrative data delivery • ***Phase 2***: Clinical results delivery

In more populous states, facilitating HIE is complicated by the increased costs and technical challenges of serving larger populations, multiple payer and provider systems built around distinct regional referral patterns, and evolving HIEs. These state-level HIEs face difficult decisions regarding the degree to which they offer services centrally or allow services to be hosted by organizations on the "edges" of the infrastructure.

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[20] 2007 Census Bureau estimates.

In California and Tennessee, state-level HIEs are building systems that directly link health entities to a centrally-managed statewide infrastructure. In California, the California Regional Health Information Organization (CalRHIO) is developing a statewide utility based on a service-oriented architecture, through which authorized and authenticated providers can query the network and receive patient-centric information. In its initial phase, CalRHIO will facilitate the delivery of medication histories and laboratory results to Emergency Departments. An overview of CalRHIO's proposed implementation approach and timeline is provided below.
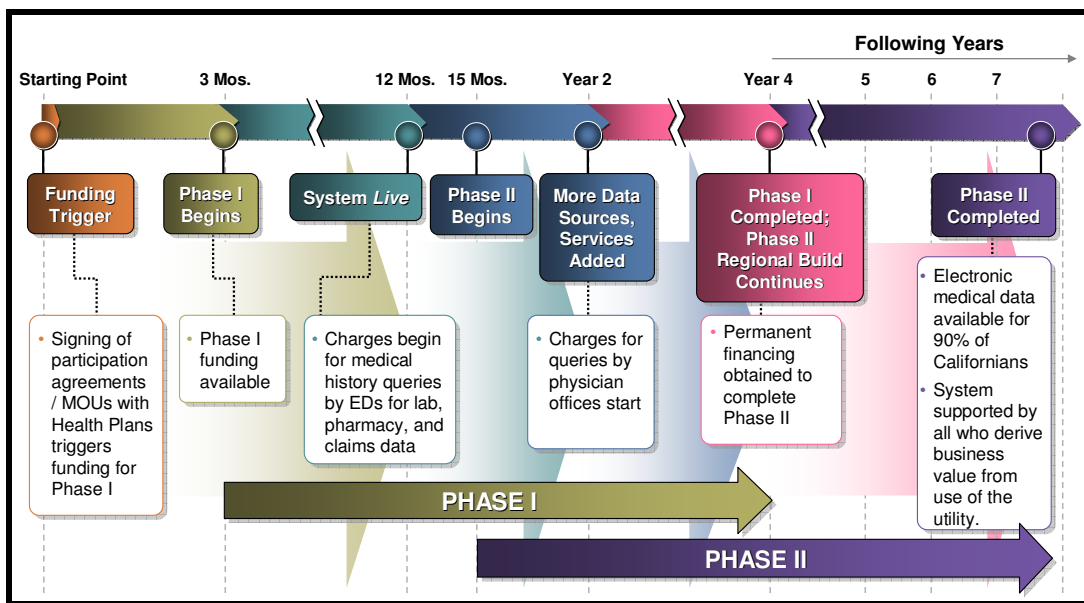
In Tennessee, an eHealth Exchange Zone is being built that will allow physicians to securely access a range of applications including electronic prescribing, licensing services, immunization registries, and longitudinal patient health records.[21] Details of the Tennessee eHealth Exchange Zone and the considerations presented by this model are provided in the profile below.

> **Tennessee: _Delineating Collaborative and Competitive Zones for Statewide HIE_**
> In 2008, the State of Tennessee awarded a 10 year contract worth between $20 and $30 million to expand the capabilities of the existing statewide broadband network, the Tennessee Information Infrastructure, for health care providers. Through the Tennessee Information Infrastructure, health practitioners can access broadband capabilities, security protocols and performance level guarantees at State negotiated rates.
>
> The Tennessee Information Infrastructure also provides the foundation for a secure, statewide portal for authorized health care providers called the Tennessee eHealth Exchange Zone. To be officially launched in the Winter 2008, the eHealth Exchange Zone will allow authorized health care providers to access aggregated patient health information from private and public insurers, renew licenses, and submit data to the state immunization registry. With guidance from the eHealth Advisory Council, the statewide public-private advisory board, the eHealth Exchange Zone will gradually expand to include additional services and functionality for health care professionals.

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[21] _2009 eHealth Progress Report and Analysis_. Tennessee eHealth Advisory Council (June 2008). Available online at http://www.tennesseeanytime.org/ehealth/documents/2008ProgressReport6-04-08.pdf.

Statewide interoperability through RHIOs

Instead of achieving interoperability through connectivity to a single state-level HIE entity, Michigan and New York are pursuing distributive networking strategies based on the implementation of common statewide policies, standards, and protocols managed by RHIOs.

Statewide interoperability based on RHIOs has two potential advantages. First, development and operational risk is reduced by organizing data exchange in regional clusters rather than a single, monolithic statewide system. Secondly, the development of and adherence to common services are projected to create economies of scale that reduce overall system development and deployment costs.

Statewide interoperability built on RHIOs has particular challenges that states' implementation strategies. By relying on multiple regional efforts, the state-level HIE must deal with multiple, independent *but* interdependent, moving pieces. Implementation can be slowed if the pace or distribution of RHIO activity is uneven or if a RHIO proves unworkable in a given geographic region.

Policy-makers in Michigan and New York have also found that developing a statewide HIE infrastructure based on regional implementation is more than just an exercise of funding regional efforts. In both states, significant public sector funding and matching resources from providers and payers have been allocated to support the statewide collaborative process for analyzing, defining, and iteratively building the core policy and technical features.

In New York, stakeholders are working collaboratively through the New York eHealth Initiative to identify commonly-used services and avoid the costly proliferation of redundant and incompatible services. Details of New York's approach to building an infrastructure of shared services are provided in the profile below.

> **<u>New York:</u> *Statewide Interoperability via a Shared, Service Oriented Architecture***
>
> In New York, the State-wide Health Information Network (SHIN-NY) will be the bedrock component of the technical health information infrastructure that supports New York's broader health care goals to improve the quality and efficiency of health care. The SHIN-NY will be comprised of standardized regional sub-networks or HIEs governed by RHIOs through contracts with health information service providers and vendors.
>
> The SHIN-NY will also include state-level services through which the regional HIEs communicate and share services, governed by RHIOs and NYeC. The regional sub-networks or HIEs and the state-level services will communicate through a service-oriented architecture using web services and common health information exchange protocols.
>
> Enterprise Service Bus (ESB) platforms will be utilized as state-level services to facilitate a public registry of SHIN-NY services not unlike the Domain Name System servers for the Internet with additional capabilities. ESB platforms will also be utilized at the regional sub-network or HIE level to support communication with the public registry among many possible providers and consumers of services and data. Candidates for core services currently under consideration include authentication, MPI, and medication management.

Interoperability through Health Record Banks

In Washington and Oregon, state-level HIE efforts are building the governance, technical, and business frameworks to create and sustain a system of health record banks. Health record banks would serve as designated repositories of consumers' health information, and consumers would grant permission for authorized health providers to deposit data to or access their health records.[22]

While pilot demonstrations have just begun in Washington (see profile below), stakeholders in both states continue to explore the implications and considerations of a state model based on health record banks.

Washington: *Supporting Health Record Bank Pilot Projects*

In December 2006, a state-legislated advisory body, the Washington Health Information Infrastructure Advisory Board submitted its final report, *Washington State Health Care Authority Health Information Infrastructure: Final Report and Roadmap for State Action* that recommended the creation of a network of Health Record Banks (HRBs).

According to this model, HRBs serve as entities where consumers may choose to store their health records. A central account locator service will ultimately be established to keep track of which HRB holds the record for each consumer. When the record is needed for care, the consumer provides access information for the record (i.e., the name of his or her bank and account number). The consumer record is then obtained directly from the applicable HRB. When the care is completed, a copy of the information is sent directly to the consumer's HRB for aggregation with the existing health record.

With respect to the governance infrastructure, the HCA is considering the creation of an entity that would serve as a utility commission and have the authority (either from legislation or rule making) to:

- Serve as a consumer ombudsman
- Accredit HRBs
- Review conformance to privacy, security, technical, and standards policies
- Provide for sanctions and penalties for misuse of the system
- Enforce rules

In August 2008, the Washington Health Care Authority awarded a total of $1.7 million to three health record bank pilot projects to test the feasibility and usefulness of online health record bank accounts to see if they offer a useful way for consumers to maintain, track and use their personal health information.

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[22] Additional details on Washington's and Oregon's support of health record banks are available online through the *AccessMyHealth* (http://www.accessmyhealth.org/) and the Health Information Infrastructure Advisory Committee (http://www.oregon.gov/OHPPR/HIIAC.shtml) respectively.

V. STATE-LEVEL HIE: KEY FINANCING CONSIDERATIONS

Whether building a single statewide technical infrastructure or relying on RHIOs or health record banks as the locus of implementation, state-level HIEs face similar obstacles in (1) securing the financial capital to build infrastructural capacity and (2) developing ongoing revenue streams to maintain operations.

The challenges stem largely from the fundamental nature of HIE, cost variability and the uncertainty of return on investment (ROI), and incentive structures within the existing health care system.

Public Good Characteristics of Statewide, Interoperable HIE

Like other network systems, interoperable HIE exhibits "public good" characteristics in that it is "non-rivaled" and "non-excludable." This means, respectively, that consumption of the HIE by one individual does not reduce availability for others; and that no one can be effectively excluded from appropriately using interoperable HIE.[23]

Two other characteristics of health information have implications for financing:[24]

- The value of information increases with use, in contrast to most assets, which exhibit decrease in value or depreciate the more they are used.

- The value of one set of information increases when linked other information, since comparisons and combinations of information can provide insights that a single set of data cannot.

While the ease of participation and increased information liquidity created through interoperability translates into broad societal benefits, it also threatens the competitive positioning of stakeholders with proprietary stakes in the collection of and provision of access to health data.

Variability of Implementation Costs

Designing, piloting and implementing interoperable HIE is a complex, multi-year process that extends beyond most organizations' annual operating and budgeting cycles. Like other long term investments, decisions on when and what to fund are determined through ROI analysis and weighed against other potential investments.

Making informed decisions regarding the timing and focus of investments in state-level HIE requires understanding of the start-up and ongoing costs of implementation and the anticipated returns in savings or revenue generation based on the services offered. Upfront and estimated annual costs for building statewide HIE capacity vary considerably depending on the proposed range of services, the intended users and participants, and vendor negotiation and selection.

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[23] Varian, H. *Microeconomic Analysis*. W. W. Norton & Co., New York, 1992.
[24] Vogel, L. "Finding Value from IT Investments: Exploring the Elusive ROI in Healthcare." *Journal of Healthcare Information Management* (Fall 2003).

Developing cost estimates in this dynamic environment requires consideration of the following environmental dimensions:

- Numbers of users, some desiring simultaneous access to various parts of the system
- Variety of users (e.g., doctors, nurses, public health authorities, patients, care-givers)
- Amount of data (i.e., petabytes)
- Number of computing systems involved
- Evolving data and technical standards
- Variety of interactions between clinicians/systems (e.g., doctor-patient, doctor-doctor, doctor-provider, provider-patient, provider-government)

With respect to technical implementation costs, state-level HIEs in smaller states have features and cost considerations similar to regional HIEs in larger markets. The table below highlights estimated start-up and ongoing costs for smaller market state-level HIEs across different technical implementations.

State *State-level HIE Initiative*	**Technical Approach**	**Cost of Tech Operations**	
		Total Start-up Costs*	Annual Cost of Operations**
Maine *HealthInfoNet*[25]	**Centralized, "Pull" Model** Using a centralized approach to share clinical data at the point of care. Clinical database/ data warehouse model – Participants send demographic and clinical data to one repository and participants query the repository.	$4.0 million (over 2 years)	$1.7 M
Rhode Island *Rhode Island Quality Institute*	**Hybrid Model** Using decentralized servers/vaults for each provider location with a central repository of exchange.	$5.0 million (over 5 years)	$1.9 M

*Funding for planning, development and pilot implementations

**Estimated annual costs for the first three years for HIE hardware, servers, and gateways; security tools; software licenses and maintenance; reporting and rules engines; interfaces; and hosting.

In states building interoperability through collaborative policy mechanisms and RHIOs, the scope of effort and types of implementation priorities vary significantly. As a result, calculating the total start-up costs and the anticipated operational expenses is considerably more challenging.

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[25] Note: these figures reflect estimates for developing and maintaining HealthInfoNet's demonstration phase for six hospitals and do not reflect delivering a fully functional statewide exchange.

In both Michigan and New York, non-profit, public-private partnerships have been created to support the statewide collaborative processes: in Michigan, the annual budget for the Michigan Health Information Network Resource Center is approximately $1.0 million per year; in New York, the estimated annual budget for the New York eHealth Collaborative (NYeC) is between $2.0 and $2.5 million. However, the total cost of the collaborative process also includes the more difficult to calculate expenses of: (1) the wide range of consulting services for planning, evaluation, and technical support, and (2) the significant in-kind contributions of staff time and resources from participating stakeholders.

Michigan and New York differ significantly in the scale of their respective investments in RHIOs. The State of Michigan has invested a total of $7.6 million over two years to support planning and implementation efforts for eight RHIOs. In New York, by contrast, the state has committed $68 million over the next two years for eight RHIOs to develop and support the SHIN-NY.

Evidence of HIE Benefits

Complicating the state-level HIEs' decision-making process are the limited data on the benefits of HIE at the scale and breadth being considered. Currently, state-level HIEs are utilizing a small, but growing body of evidence that quantify the efficacy and benefits of HIE in specific settings or use cases. The table below illustrates some of the key studies supporting the benefits of HIE deployment.[26]

Use Case	Studies and Relevant Findings	State-level & Regional HIE Examples
Chronic Disease Management through Clinical Health Records and Decision Support Tools	• QualChoice (2005) found that use of clinical reminder system to support disease management resulted in savings of $8.07 per member per month. • Shared Health study (2007) found that physicians use of a claims-based EHR reduced length of hospital stays and lowered admission rates for their patients	**State-level HIEs** • VITL (Vermont) **Regional HIEs** • CareSpark (TN, VA) • BHIX (New York)
Clinical Results Delivery	• The Indiana Health Information Exchange (IHIE) estimated that its clinical messaging system reduced the cost to deliver reports by 50%.	**State-level HIEs** • DHIN (Delaware) **Regional HIEs** • HealthBridge (OH, KY, IN) • IHIE (Indiana)
eRx (e.g., health plan eligibility & formulary, med history, new Rx and renewal requests)	• Multiple studies show savings from error reduction and increased formulary compliance.	**State-level HIEs** • MA-SHARE Rx Gateway (MA) • SHIN-NY (New York) **Regional HIEs** • Regenstrief INPC (Indiana)

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[26] An annotated inventory of studies documenting the value of health information exchange can be found online at http://www.slhie.org/Docs/Inventory.xls.

Use Case	Studies and Relevant Findings	State-level & Regional HIE Examples
Provision of Patient Data to Physicians in Emergency Departments	• Regenstrief study (2002) found that use of clinical records could decrease ED care charges by $26 per encounter. • HealthCore study (2006) found that ED visit that included patient clinical summary yielded $604 cost savings per encounter. • Vanderbilt study (2007) estimated $8 million in annual savings if an HIE delivered data to EDs in Memphis TN.	**State-level HIEs** • VITL (Vermont) • RIQI (Rhode Island) • CalRHIO (California) **Regional HIEs** • MidSouth eHealth Alliance (TN)
Public Health Reporting	• Regenstrief (2008) found that automated electronic laboratory reporting improves the completeness and timeliness of disease surveillance, which will enhance reporting efficiency.	**State-level HIEs** • SHIN-NY (New York) • VITL (Vermont) **Regional HIEs** • IHIE (Indiana)

Impact of Health Care Structure and Incentives

The current health care system, particularly the reimbursement structure for health provision, directly influences efforts to advance health IT adoption and the expansion of interoperable HIE. Reinforced by a complex array of regulations and laws, the system has evolved into a patchwork of administrative processes that creates barriers to the collaboration needed to develop the systems to promote quality care.

By providing patient information in a complete, accurate and timely fashion, interoperable HIE has the potential to increase efficiency by reducing the need for duplicate or redundant testing. However, in a fee-for-service reimbursement system, physicians and hospitals face financial incentives to *increase* testing and other procedures.

Moreover, health providers costs are not commensurate with their benefits. While health care providers shoulder health IT acquisition expenses, near-term productivity losses, and implementation risks, more than 80% of the value accrues to third party, fiscal intermediaries (i.e., those who hold the risk for the cost of care, whether it be health plans, employers, or providers themselves who bear risk through capitation arrangements). [27]

Although payers and purchasers are expected to derive most of the benefits from wide spread exchange of health information, they remain reluctant to invest in shared HIE frameworks owing to their inability to prevent the flow of value of HIE to competitors. In a fragmented health system, a health plan's investments in HIE will improve the care not only for their members, but the members of their competitors as well.

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[27] *The Value of Healthcare Information Exchange and Interoperability*. Center for Information Technology Leadership (2005).

VI. SECURING CAPITAL TO BUILD INFRASTRUCTURAL CAPACITY

While funding for pilot projects and initial planning have generally been available, bringing interoperability to scale is an iterative, developmental process that requires reliable and sustained funding. Facing challenging economic conditions and misaligned incentive structures, state-level HIEs have had a difficult time accessing adequate capital.

All state-level HIE leaders, participants and funders indicated the need for collective financing approaches that draws funds from the public, non-profit, and for-profit sectors. However, no single financing strategy has emerged that works across all settings and circumstances. Instead the research reveals that each state-level HIE effort must understand the opportunities, constraints and limitations inherent to the various funding sources and optimize its strategy based on the characteristics of its health care market.

To assess the viability and applicability of financing approaches for capacity building, the research team built an analytic framework around three fundamental questions:

(1) Who are the funders?
(2) What are their sources of funds?
(3) How do funders collect and disbursing their funds?

The diagram below illustrates the financing components arrayed across the public, non-profit and private sectors. A glossary is provided in *Attachment 1*.

Public Sector ⟵⟶ **Private Sector**

Funders	Federal Gov't	State Gov't	Philanthropy	Stakeholder Organizations[28]	Financial Institutions
Funding Sources	○ *Operating budget* ○ *Capital budget* ○ *Assessment* ○ *Special purpose funds*		○ *Operating budget* ○ *Capital budget*	○ *Operating budget* ○ *Capital budget*	○ *Equity investors* ○ *Bond purchasers*

The section that follows highlights the terms, conditions, dependencies, and considerations associated with each funder and their funding sources.

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[28] Stakeholder organizations includes providers, payers, and employers.

As illustrated by the table below, the public sector, through state and federal grants and contracts, has provided the largest proportion of funding for state-level HIE planning, organization, governance, and technical capacity building. To a lesser extent, philanthropies and providers, largely through matching contributions, have also supported state-level HIE capacity building.

Cumulative Investments in State-level HIE Capacity Building (2000-2008)

Public Sector ⟷ Private Sector

	Fed Gov't	State Gov't	Philan-thropy	Providers	Payers	Financial Institutions	Total Funds
Rhode Island	**76%**	<1%	24%	<1%	<1%	0%	**$11 M**
Vermont	12%	**79%**	<1%	9%	<1%	0%	**$5 M**
Maine	11%	8%	**40%**	**40%**	<1%	0%	**$3 M**
California*	2%	<1%	10%	6%	5%	**76%***	**$20 M***
Tennessee	34%	**61%**	<1%	<1%	<1%	0%	**$15 M**
Florida	5%	**93%**	<1%	<1%	<1%	0%	**$6 M**
Michigan	<1%	**87%**	<1%	8%	4%	0%	**$6 M**
New York	4%	**61%**	<1%	32%	4%	0%	**$202 M**

 * Note: CalRHIO is seeking $11 million from private equity firms

Federal Government: Grants and Contracts

Federal investments in HIE have focused on policy coordination, privacy and security, technical standards and certification, and discrete demonstration projects. Federal funding for state-level HIEs have been made through:

- ***State and Regional Demonstration Projects***. AHRQ awarded six 5-year, $5 million contracts to support statewide and regional data sharing and interoperability activities. Five states – Colorado, Indiana, Rhode Island, Tennessee and Utah – started their contracts in October 2004; the remaining state, Delaware, began its project in October 2005.

- ***Health Information Security and Privacy Collaborative***. Between October 2005 and December 2007, HHS awarded $24.3 million to a consortium led by RTI international to: (1) identify both best practices and challenges, (2) develop consensus-based solutions for interoperable electronic health information exchange (HIE) that protect the privacy and security of health information, and (3) to develop detailed implementation plans. Additional funding from HHS continues to support states and territories collaborating to address the privacy and security challenges posed by the exchange of health information within and across states.

- **HIE Biosurveillance Program**. Awarded in the January 2008, the Centers for Disease Control and Prevention committed $38 million over five years to create biosurveillance networks that will cover large areas of two states and a third region covering portions of three states.

- **Medicaid Transformation Grants**. These grants were established by Congress for fiscal years 2007 and 2008 and have been used to advance a range of Medicaid system innovations, including health IT. In January 2007, CMS awarded 33 grants, totaling $103 million. Eighteen of these grants were for health IT and HIE-related initiatives, totaling $64 million.

  For example, Medicaid Agencies in Alabama, Arizona, Connecticut, the District of Columbia, Indiana, Kentucky, Oregon, Rhode Island, and West Virginia are using their Medicaid Transformation Grants to (1) integrate state government's many internal data silos and (2) provide a platform to share Medicaid claims data with authorized users in the broader provider community.

- **NHIN Trial Implementations**. In September 2007, the Department of Health and Human Services awarded contracts totaling $22.5 million to nine HIEs to begin trial implementations of the Nationwide Health Information Network (NHIN). Over the last year, these organizations have collaborated to specify, build, test, and demonstrate a core set of capabilities to enable basic exchange of health information between the different HIE networks, patients, and other stakeholders.

Attachment 4 illustrates the current distribution of federal grants and contracts for state-level HIE capacity building across all 50 states.

While leveraged by a handful of state-level HIEs, federal contracts and grants have limited availability and are driven by the particular objectives of the sponsoring federal agency, which may not align with the needs of state-level HIE initiatives. In addition, states' efforts to consolidate health IT capabilities or create shared functionality are often hindered by rules that limit the use of federal funds beyond their originally intended purposes.

Federal Government: Leveraging Medicaid Management Information Systems
In addition to grants, the federal government also supports the development of IT capabilities through ongoing support for the Medicaid program's claims processing systems, the Medicaid Management Information Systems (MMIS). The size of Medicaid agencies' MMIS investments is substantial. In FY 2004, combined State and Federal spending for Medicaid IT was over $2.7 billion. [29]

In recent years, new technologies have extended the capabilities of MMIS and making it a more valuable component of the statewide HIE landscape. For example, claim history files have been accumulated into data warehouses and data marts for easier analysis. Data mining techniques have been found to be useful in identifying population characteristics and complex data analysis and time-series modeling and forecasting. [30]

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[29] *Establishing a Foundation for Medicaid's Role in the Adoption of Health Information Technology: Opportunities, Challenges, and Considerations for the Future.* Center for Health Policy and Research (April 2007). Available online at http://www.umassmed.edu/uploadedFiles/UMass_HIT_Report.pdf.
[30] Ibid.

State Medicaid agencies can leverage MMIS funding to advance statewide HIE efforts. The nature and implications of using federal or state Medicaid funding to support state-level HIE is governed by federal matching laws. [31]

The table below highlights the range of federal and state financial participation across state-level HIE deployment scenarios. [32]

Medicaid-State-level HIE Relationship	Eligible Activities *(State Portion)*	Eligible Activities *(Federal Portion)*	Examples
Medicaid operates statewide HIE	HIE development costs *(state share 10%)*	HIE development costs *(federal share 90%)*	A Medicaid Agency designs, builds, and operates HIE hardware and software. The Medicaid Agency permits access to its data by others. Note: Non-Medicaid agencies and entities must pay for their linkages to Medicaid operated HIE.
	Ongoing administrative costs *(state share 25%)*	Ongoing administrative costs *(federal share 75%)*	
Medicaid contracts with State-level HIE to operate services	Ongoing administrative costs *(state share 25%)*	Ongoing administrative costs *(federal share 75%)*	A Medicaid Agency contracts with a state-level HIE to provision Medicaid data to providers. The Medicaid Agency pays the state-level HIE a per member-per month or transaction fee.
Medicaid contracts with entities to participate in State-level HIE	Programmatic costs *(state share 50%)*	Programmatic costs *(federal share 50%)*	Through a P4P program, a Medicaid Agency reimburses physicians who participate in the state-level HIE at a higher rate.

While CMS officials recently indicated that states have yet to exercise the MMIS financing mechanism to support state-level HIE, a number of states are reportedly working with CMS and their state Medicaid agencies to explore these options.

As MMIS systems continue to modernize and become more visible parts of a state's HIE portfolio, state governments and state-level HIEs will have to negotiate and navigate technical, policy, and governance relationships at the provider, regional, and state levels.

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[31] As a general rule, the federal government match for Medicaid administrative expenditures is 50 percent; however, the match can be higher for certain administrative functions. In fact, for the design, development, and installation of MMIS, the federal match is 90 percent, and for ongoing operational maintenance, the federal match is 75 percent.
[32] *State Medicaid Agencies' Initiatives on Health Information Technology and Health Information Exchange*, U.S. Department of Health and Human Services, Office of Inspector General (August 2007). Available online at http://www.oig.hhs.gov.

State Government
Recognizing the importance of health IT and HIE for their health care objectives, state governments have steadily increased their investments in HIE in recent years, drawing upon capital budgets, operating budgets, assessments, and special purpose funds.

Operating Budgets. State's operating budgets include the expenditures for a single period of appropriations, either annually or biannually. While nearly every state-level HIE has drawn some funding from their state's operating budgets, reliance on the legislative budget and appropriation process can prove a precarious strategy.

Largely dependent upon revenues which can fluctuate year-to-year, state's operating budgets are also subject to balanced budget requirements that often put funding for discretionary programs at risk during economic downturns. Florida's experience, as illustrated in the profile below, demonstrates the risks and consequences of relying on annual appropriations.

> **Florida: *Risks of Reliance on State Operating Budgets***
> In 2004, Governor Bush established Florida as a leader among state-led HIE efforts by creating the Governor's Health Information Infrastructure Advisory Board (Advisory Board). Over the course of the next two years, the Advisory Board developed a concept for statewide health information data exchange utility called the Florida Health Information Network (FHIN).
>
> From 2005 to 2007, the Advisory Board and Florida's Agency for Healthcare Administration (AHCA) succeeded in securing three rounds of funding to support eight RHIOs: $1.5 million in 2005, $2 million in 2006, and $2 million in 2007.
>
> In 2008, AHCA requested $6.8 million for the FHIN Grants Program to advance the development of RHIOs in Florida. However, in the wake of a flagging economy, Florida's state government faced significant revenue shortfalls that lead to large scale budgetary cuts to many health programs. As a result of these fiscal pressures, the Florida state legislature provided no funding for the FHIN Grant Program in 2008.
>
> In the current fiscal crisis, AHCA is working with its fledgling RHIOs to secure federal funds through the FCC Rural Telecommunications Grants and CMS's portion of Medicaid Management Information System development. As an alternative to state funding for the FHIN, the State of Florida is developing a no-cost proposal for a vendor to provide of Medicaid claims and medication history services statewide.

Capital Budgets. In 40 states, capital financing mechanisms can be utilized for infrastructural investment needs.[33] The capital budget is primarily funded through the issuance of state general obligation bonds for large, capital-intensive projects including land acquisition, construction, and state government IT projects.[34] Typically, states issue the bonds to investors with the promise to repay the debt either through the state's taxing authority or the revenue generated by the projects the bonds finance.

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[33] Reed, B. J.; Swain, J.W. *Public Finance Administration*. Sage Publications, Thousand Oaks, CA, 1997.
[34] See http://www.finance.state.mn.us/budget/capital/index.html for additional information of state government and capital financing.

Capital funding has been successfully used in a number states to support statewide health IT projects. In Rhode Island, the state established a $20 million revenue bond to create the state's HIE. The revenue bond is contingent on contributions from other stakeholders like health plans. The state will pay for the share of costs for public program populations.

In 2007, Missouri established the Health Care Technology Fund for state investments that "promote technological advances to improve patient care, decrease administrative burdens, increase access to timely services, and increase patient and health care provider satisfaction." The fund will consist of donations and monies appropriated by the general assembly. Allowable uses of the fund include implementation of technologies like EHRs, community health records, personal health records, e-prescribing, and remote monitoring systems. The fund will be administered by the Department of Social Services, the entity responsible for the state Medicaid program. Procurement projects will take into consideration recommendations made by the Missouri HealthNet oversight committee, a public-private body responsible for reviewing and advising the Department of Social Services on state health improvement plans.[35]

Unlike operational budgets, capital budgets typically allow more balance between revenue and expenditure flows from year to year. However, capital budgeting faces a number of implementation challenges. Capital budgeting tools typically require legislative approval of bond issuance, adequate oversight of fund disbursement, and sufficient funds to pay bondholders when bonds are due.

Moreover, in many states, state-level HIE projects must compete with better understood and more traditional capital projects for a limited pool of funds that continues to shrink in the wake of the current economic turmoil. One analyst recently estimated that nearly $100 billion of new infrastructure projects haven't been brought to market, and that projects will either be scaled back, postponed, or they'll have to rely more on government revenue.[36]

Special Purpose Funds. "Special purpose funds" refer to funding sources that are not subject to the traditional legislative appropriation process. Examples of special purpose funds include tobacco settlement funds and federal Medicaid waivers.

In June 2007, Connecticut enacted House Bill 8001 that allocated the transfer of a total of $1 million over two years from the Tobacco and Health Trust Fund for the Connecticut Health Information Network (CHIN).[37]

In addition to tobacco settlement funds, states have also utilized CMS funding through Medicaid Section 1115 waivers to support health IT adoption and HIE development. Section 1115 of the Social Security Act is a broad demonstration authority that allows the Secretary of HHS to permit a state to use federal Medicaid matching funds to pay for expenditures that would otherwise not be allowable under the Medicaid statute (Title XIX of the Act).[38]

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[35] *Accelerating Progress: Using Health Information Technology and Electronic Health Information Exchange to Improve Care*. State Alliance for eHealth (September 2008).
[36] Richburg, K and Vick, K. "Fiscal Crisis Is Hitting Some States Hard California Seeks Emergency Loan." *Washington Post* (October 4, 2008).
[37] The CHIN is a partnership between the Univ. of Connecticut, Akaza Research, Inc., and Connecticut's state agencies to link diverse databases across agencies. Details available at http://publichealth.uconn.edu/CHIN.php.
[38] These expenditures can be for populations not otherwise allowable, services not otherwise allowable, or both.

For example, state-level HIE efforts in New York have been financed as part of the matching commitment for a Medicaid Waiver as illustrated in the profile below.

> **New York: *Leveraging A Medicaid Waiver for Statewide Interoperability***
> Funds for New York's Health Information Infrastructure derive from special purpose funding from a Waiver called the Federal-State Health Reform Partnership (F-SHRP). Effective October 1, 2006, the Centers for Medicare and Medicaid Services (CMS) approved New York's five-year F-SHRP Demonstration Waiver to reform New York's Medicaid program.
>
> In accordance with the terms of the waiver, New York must invest $3 billion over the five-year demonstration in health care reform initiatives in order to receive $1.5 billion in federal funding. New York can allocate funding for reform initiatives that promote the efficient operation of the State's health care system; right-size New York's acute care system; shift long term care system from institutional to community care; expand e-prescribing, EMRs and RHIOs; and improve ambulatory care.
>
> As part of its matching commitment to the F-SHRP demonstration, the State of New York has leveraged its capital budgeting authority to award over $158 million to advance a statewide health information network.

More recently, Rhode Island attempted to leverage a 1115 Waiver to be used, in part, to support statewide health IT efforts.[39] According to its Waiver request, Rhode Island would restructure its Medicaid program to establish a "sustainable cost-effective, person-centered and opportunity driven program utilizing competitive and value-based purchasing to maximize available service options" and "a results-oriented system of coordinated care."

While special purpose funds offer an attractive source of funds, they are relatively rare and rising federal and State budgetary pressures will increase competing demands on these financing mechanisms. Moreover, federal budget neutrality requirements constrain the ability of state Medicaid agencies to utilize 1115 waivers to support health IT and HIE investments.[40]

Special Assessments. In some respects, special assessments resemble taxes. The primary objective of the special assessment, as in the case of taxes, is to advance a common benefit.[41] Unlike taxes, which are paid without reference to specific individual benefits, special assessments are created for specific purposes.

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[39]The US Department of Health and Human Services. *Medicaid Waiver Factsheet*. Accessed online at http://www.cms.hhs.gov/MedicaidStWaivProgDemoPGI/downloads/Rhode%20Island%20Global%20Consumer%20Choice%20Compact%20Items%20Under%20Review.pdf on October 1, 2002.

[40] A state seeking federal financial participation under a section 1115 waiver must show that its demonstration will be "budget neutral" to the federal government. That is, the state must show that, over the waiver period, federal Medicaid spending under the waiver will not exceed what the federal government would have spent in the absence of the waiver. See *The Medicaid Resource Book*. Kaiser Commission on Medicaid and the Uninsured (January 2003). Available online at http://www.kff.org/medicaid/2236-index.cfm.

[41] Hunter, Merlin H. "Outlines of Public Finance." 1921. New York, London, Harper & Brothers. Full text available online at http://www.archive.org/details/outlinesofpublic00huntrich.

In order to support its state-level HIE efforts and health IT adoption plans, Vermont used a special assessment to create the Vermont Health IT Fund, which is profiled below.[42]

Vermont: _Creating Health IT Fund through Assessments on Payers_

In April 2008, the Vermont passed legislation to create the Vermont Health IT Fund. Drawn down in annual increments by Vermont's state-level HIE, the Vermont Information Technology Leaders, the Vermont Health IT Fund will be used to support both statewide HIE and the adoption of certified Electronic Health Records.

Beginning Oct. 1, 2008, each health insurer operating in Vermont will pay a quarterly fee into the fund. Insurers can choose between paying 0.199% of all health care claims paid for their Vermont members in the previous quarter, or a fee based on the insurer's proportion of overall claims in the past year, as calculated by the Vermont Department of Banking, Insurance, Securities and Health Care Administration. Medicaid is making a voluntary annual contribution of approximately $250,000 per year.

The process to collect funds from payers is being developed through the Vermont Department of Banking, Insurance, Securities and Health Care Administration's rule making authority. Vermont's Health Care Information Technology Reinvestment Fee is expected to raise a total of approximately $32 million over the next seven years.

Other states are exploring the use of assessments to raise capital for state-level HIE. In New Jersey, funding for statewide HIE will likely depend upon the New Jersey Department of Banking and Insurance (DOBI). All of DOBI's operations are directly funded by an assessment against the insurers admitted to do business in New Jersey. Each year, DOBI calculates its operating costs and is fully reimbursed by the insurance industry; no traditional tax funds support its work. Consequently, the DOBI's work to develop, implement, and deploy health IT and a statewide network will be reimbursed each year by the statutory insurer assessment.

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[42] Additional details on Vermont's Health IT Fund are available through the Vermont Information Technology Leaders' website at http://www.vitl.net/.

Philanthropic Sector
Philanthropies have been a significant source of start-up investments for state-level HIE capacity building. Much like the public sector, philanthropies recognize the potential social value that interoperable HIE presents. Philanthropic investors have contributed funds with little expectation for a financial return on their capital.

In many states, foundations have provided critical funding to incubate the planning and governance functions of state-level HIE initiatives. In Arizona, the St. Luke's and the BHHS Legacy Foundation funded the development of the statewide Arizona Health-*e* Connections roadmap. In New York, the United Hospital Fund provided funds and essential in-kind support to the statewide collaborative NYeC. In California, CalRHIO has received nearly $2.5 million in total from the Blue Cross of California Foundation, the Blue Shield of California Foundation, the California HealthCare Foundation, and the Blue Shield Foundation of California.

Though philanthropic funding tends to focus on planning and demonstration activities, the state-level HIE in Maine, HealthInfoNet, has leveraged a significant matching grant from a conversion fund for implementation efforts. The Maine Health Access Foundation (MeHAF) awarded a $1 million challenge grant to HealthInfoNet that may be accessed when match funds are raised and the Phase III demonstration phase is operational.

Charitable organizations, like state budgets, are subject to changing economic conditions. Charitable contributions are highly correlated with stock market performance, and contributions are forecasted to lag during this period of poor stock performance.

Private Sector
In order to support their capital investment needs, a number of state-level HIEs have turned to funding sources in the private sector, including providers, payers, and even vendors and financial institutions. A key distinction between public and private financing is the pressure to return value to private sector stakeholders is more acute in the near term than the demands of public and non-profit investors.

Providers. As noted above, hospitals and physician practices have significant limitations in their ability to bear the capital costs of statewide HIE development. In addition, the recent economic downturn puts additional pressure on providers to reduce costs.

With the exception of integrated delivery systems, hospitals generally lack the capital or sufficient positive cash flow to finance large investments. Hospital operating margins have been steadily declining since 1996, and one in three hospitals nationwide has a negative total operating margin.[43] Even hospitals with positive cash flows have challenges amassing the capital internally to make large IT investments, and when they do invest in health IT, it is aligned to support the organizational needs. As a result, IT investments tend to focus on internal, tactical operational needs and funding for participation in and support of HIE are often lower strategic priorities.[44]

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[43] *Spending Our Money Wisely: Improving America's Health Care System by Investing in Health Care Information Technology.* The Health Technology Center (May 2003).
[44] One state, Maryland, proposes to fund statewide interoperable HIE using its unique authority to set rates for what hospital charge for services. The Maryland Health Care Commission plans to use its rate setting authority to create a $10 million pool of funds for statewide health IT and HIE initiatives. More information on Maryland's approach is available online at http://mhcc.maryland.gov/electronichealth/.

The ambulatory provider market, which delivers almost 90% of the primary care in the United States, has very limited access to capital. Though some larger practice groups have invested in health IT for strategic advantage, most have been slow to adopt health IT and very few have engaged in community-based HIEs, despite the increasing availability of incentives.[45]

Payers. As the stakeholder segment expected to derive the greatest value from interoperability, payers have traditional been seen as a source of capital for state-level HIE efforts. In Rhode Island, for example, the Rhode Island Quality Institute (RIQI) has proposed a "Cost of Care Model" that supports both capital and operating needs and relies on funding from health insurers. According to this model, insurers would pay a percentage of the annual capital and operating needs based on their percentage of covered lives in the state.

Models based on payers must take into consideration the participation of non-domiciled health plans. If the non-domiciled insurers are not mandated to pay for their members' use of the HIE, or if they increase their premiums to account for their participation, the domiciled insurers could be at a price disadvantage.

More generally, private health plans also contend that plans to leverage payers to fund state-level HIE capacity should also include nation's two largest insurers, Medicare and Medicaid. Without the commitment of public payers, private health plans and their members will be forced to subsidize development for a significant portion of any given state's population. Additionally, funding mechanisms that rely on public or private payers do not account for the uninsured populations use of the system and may face challenges with respect to ERISA.[46]

Vendors. A number of HIEs have successfully leveraged partnerships with technology vendors to secure funding or in-kind contributions to advance implementation. In Texas, leaders of the state-level HIE effort are exploring the viability and applicability of a unique financing arrangement for statewide HIE services that relies exclusively on financing from technology vendors. The financing approach is modeled after the development and operations of *TexasOnline*.[47]

In May 2000, the State of Texas awarded a zero-cost contract to a private sector vendor to develop *TexasOnline*, an Internet-based portal that provides to access government services. Under the terms of the contract, no public funds were expended, and the vendor bore responsibility for all of the costs associated with the development and operation of the portal, regardless of the portal's profitability. The contract initially provided the vendor with the ability to retain 90% of the revenue generated by *TexasOnline* to offset its upfront outlay to develop and operate the portal.

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[45] Grossman, JM and Cohen, G. "Issue Brief: Despite regulatory changes, hospitals cautious in helping physicians purchase electronic medical records." *Center for Studying Health System Change* (September 2008). Available online at http://www.hschange.com/CONTENT/1015/.

[46] ERISA, the federal Employee Retirement Income Security Act of 1974, governs pension and employee fringe benefit plans established by private sector employers. ERISA contains a broad provision, the "preemption clause," providing that ERISA supersedes state laws that "relate to" private sector employer-sponsored plans. Vermont is currently exploring ERISA considerations for financing state-level HIE through assessment fees on health payers.

[47] *Innovative Funding for Innovative State IT: New Trends and Approaches for State IT Funding Version 2.0*. National Association of State Chief Information Officers (November 2003). Available online at http://www.nascio.org/publications/documents/NASCIO-FundingReport2003.pdf.

The *TexasOnline* portal currently generates revenue from fees charged to citizens. Convenience fees charged to users of certain services provided through the portal, such as driver license renewal fees, constitute approximately 95% of the portal's revenue. Other types of fees that generate revenue for the portal are:

- *Subscription fees*, which are charged to an entire population for a government service regardless of whether the user obtains the service online or by other means. An example is the charging of a fee for the renewal of professional licenses, regardless of whether the license is renewed online or via another method, such as in person or by mail.

- *Service revenue*, which is derived from fees charged to government entities that request that *TexasOnline* develop applications for them in instances where the government entities do not wish to charge a fee to citizens for use of the application.

In a case study of *TexasOnline*, the National Association of State Chief Information Officers determined successful implementation of vendor-financed public sector IT projects is based on the following elements:

- A viable revenue stream with compelling business model.

- A viable customer base with sufficient structure to ensure that potential customers don't use alternative services and raise the costs for those that do use the state-sanctioned service.

While the vendor-financed model is untested in the context of state-level HIE, it is becoming an increasingly attractive financing mechanism in light of the anticipated budget shortfalls in the public sector. In fact, the State of Florida is considering a variation to this approach, whereby a no-cost contract would be released calling for a vendor to provide Medicaid claims and medication history services statewide.

Financial Institutions. Financial institutions have long been a source of capital for complex infrastructure projects in which initial development costs exceed the corresponding near term receipt of revenue. In contrast to public and philanthropic investments, the private capital market typical operates on calculus of revenue and risk:[48]

- Entrepreneurs and investment opportunities pull early investors into investments with upside financial potential, and there is an expectation of future liquidity.

- The early successes are tempered by early losses.

- If early success is sustained and scaled, this condition pulls even more capital, and mezzanine investors buy out early-stage.

Financial institutions can cover the initial start-up costs through "equity," i.e., purchasing an ownership stake in the organization, or through a "debt" mechanism, i.e., providing a loan.

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[48] World Economic Forum. "Blended Value Investing: Capital Opportunities for Social and Environmental Impact." (March 2006). Available online at http://www.weforum.org/pdf/Initiatives/Blended_Value_Report_2006.pdf.

As most entities overseeing and maintaining state-level HIE operations are not-for-profit entities, financial institutions have little incentive to take equity positions in these organizations. Debt instruments, on the other hand, may offer an attractive vehicle to funders.

In California, CalRHIO is working on a financing strategy that proposes to leverage health plans willingness to pay for HIE services as collateral for debt from private equity investors.

> ### California: *Raising Capital through Private Equity*
>
> In April 2008, the California Public Employees' Retirement System (CalPERS) announced it will endorse and support a statewide health information exchange system currently being developed by the California Regional Health Information Organization (CalRHIO), a not-for-profit organization committed to providing health care providers and patients access to vital health information.
>
> CalPERS directed its current health plans – Anthem Blue Cross, Blue Shield of California and Kaiser Permanente – to negotiate contract terms with CalRHIO. Because health plans and their members are the primary beneficiaries of the benefits to be derived from accessing patient data, health plans are being asked to pay for the information delivered in Phase 1. Charges will be generated only when data are returned and will appear as part of the ED claim.
>
> CalRHIO estimates that it will require $11 million to complete Phase 1, which will allow Emergency Room physicians in 90% of California's hospitals to access patients' medical histories, lab, pharmacy, and claims data. Funding for Phase I will be through private equity based on the ability of CalRHIO to secure commitments from at least three major health plans in California to participate in the CalRHIO HIE initiative. This gating factor is intended to ensure a clinically robust and relevant data set which will drive user adoption, secure an adequate value proposition for participants, and deliver a positive return on the investment.
>
> Round 2 funding will commence upon successful completion of Phase 1 of the technology development, which is estimated to occur at the end of year 4. These funds are expected to be composed of tax-exempt funding i.e., bonding financing. This approach will allow CalRHIO to continue operating as a non-profit utility for all the California healthcare community and complete integration with local/regional EHR systems such that 90% of all Californians will have a record in the system.

The availability and terms and conditions of loans from financial institutions depends on the lenders' confidence in the recipients ability to repay the loan. The higher the uncertainty of payback, the more stringent the terms and the higher "risk" premium or cost of the loan. In a market characterized by uncertain value propositions and unproven business models, health IT investments carry higher interest rates than less risky investment opportunities.

Successfully addressing the limitations of capital investment instruments is further compounded by the skills required to engage in such creative financial mechanisms. Finding non-profits with the skills and experience to assess and execute the various types of structured debt and equity face can be a significant challenge.

VII. BUSINESS MODELS FOR STATE-LEVEL HIE

The goal of achieving statewide interoperability does not end with implementation. State-level HIEs must also develop business plans to address the ongoing challenges of sustaining the infrastructure for interoperability.

In order to remain viable entities beyond their initial deployment stage, state-level HIEs must deliver value to their customers in one of two ways: by reducing costs or creating revenue generation opportunities. In a dynamic marketplace characterized by structural disincentives for HIE, emerging alternatives and competitive challenges, rapidly evolving technologies, and wide cost variation, developing workable business models continues to be a significant challenge.

While a handful of local HIE efforts have developed successful models based on transactional efficiencies for participating providers, state-level HIE initiatives continue to assess the viability of shared infrastructure, applications, and services for generating the revenues needed to sustain operations and/or repay interest on debt instruments.

Value Proposition Across Services and Stakeholders
Health care economists often view the value of investments in health IT in a series of phases.[49] Beginning in the 1960s, health IT investments focused on financial systems – billing, general ledger, and payroll – which support the organization's financial accounting and reporting. During this phase, IT investments were generally viewed as substitutions for labor costs, a fairly common initial stage for IT investments in a number of industries. The value to the organization stems from the fact that the financial resources invested in IT generated a return in the form of labor cost savings that were greater than the initial investment.

Starting in the late 1960s and carrying over into the 1970s, the primary emphasis of health IT shifted to more efficient processing of patients, extending the ability of technical and professional staff to work more efficiently and effectively, and the ability to more easily generate clinical and management reports from data that was increasingly stored electronically.[50]

Entering the 1980s and 1990s, attention turned to enterprise-wide clinical systems, including clinical data repositories and visions of a fully computerized electronic patient medical record. In the last 10 years, the focus has shifted toward the value of interoperability and the concept that increasing levels of interoperability will create different levels of value. Researchers at Center for Information Technology Leadership (CITL) have defined these levels of data exchange as:

- Level 1: No use of IT to share information

- Level 2: Transmission of non-standardized information via basic IT; information within the document cannot be electronically manipulated (i.e., fax or personal computer-based exchange of scanned documents, pictures, or portable document format files)

- Level 3: Transmission of structured messages containing non-standardized data; requires interfaces that can translate incoming data from the sending system's

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[49] Vogel, L. "Finding Value from IT Investments: Exploring the Elusive ROI in Healthcare." *Journal of Healthcare Information Management* (Fall 2003).
[50] Ibid

vocabulary to the receiving organization's vocabulary (i.e., email of free text, or PC-based exchange of files in incompatible/proprietary file formats, HL-7 messages)

- Level 4: Transmission of structured messages containing standardized and coded data; idealized state in which all systems exchange information using the same formats and vocabularies (i.e. automated exchange of coded results from an external lab into a provider's EHR, automated exchange of a patient's "problem list")

To illustrate the differences in values derived between different levels of data exchange, consider that both free-standing and hospital-based outpatient clinicians use external laboratories. Interoperability between these providers would reduce redundant testing, delays and costs associated with a paper-based Level 1 system, and speed results reporting. CITL estimates the savings to yield an annual national benefit of $8.09 billion at Level 2, $18.8 billion at Level 3 and $31.8 billion at Level 4.[51]

In their efforts to facilitate statewide interoperability, state-level HIEs must define the value proposition of a rapidly expanding array of technical applications against each constituency. The types of applications and services typically considered by state-level HIEs include:

- Clinical Messaging – Results delivery, provider communications.

- Clinical Records – Medication history, patient allergies, radiological archives, test results archives, emergency department visit history, physician notes.

- Quality Reporting – Data reporting for quality initiatives (pay-for-performance, comparative effectiveness, clinical trials, etc).

- Care Management – Clinical decision support and chronic care management tools.

- Public Health Reporting and Surveillance – Mandatory reporting from hospitals, physician practices and laboratories to public health authorities.

- Personal Health Records – An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be drawn from multiple sources while being managed, shared, and controlled by the individual.[52]

As value for these services is blended and built across systems, there is a critical need to credibly calculate the anticipated value for proposed services across all potential "customers."

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[51] Walker J;Pan E;Johnston D;Adler-Milstein J;Bates DW;Middleton B; "The Value Of Health Care Information Exchange And Interoperability." *Health Affairs* (January 2005).
[52] *Report to the Office of the National Coordinator for Health Information Technology on Defining Key Health Information Technology Terms*. The National Alliance for Health Information Technology (April 28, 2008).

Stakeholders or potential customers who will derive value from state-level HIE include:

- Physicians (small, medium, and large general and specialty practices)
- Hospitals (emergency department and in-patient facilities)
- Clinical service providers (laboratories and pharmacies)
- Payers (health insurance companies and federal/state government)
- Employers (public/private firms that purchase health care for their employees)
- Researchers (public health authorities, academia, and pharmaceutical companies)
- Consumers (patients and care-givers)

The grid on the following page illustrates anticipated benefits for a range of potential state-level HIE applications across stakeholder groups.[53]

Recognizing the potential revenue opportunities from providers and laboratories, many HIEs, including a number of state-level HIEs, have focused on viewing and delivery of test results as their first application.

However, there are several important implications for choosing this sequence. First, test results are a small subset of the range of clinical data exchange that has been envisioned by policymakers. Although viewing and delivery of results may be a stepping-stone to broader exchange, it is also possible that efforts will stall at the current stage without a clear business model for comprehensive data exchange.[54]

Secondly, the technical approach to viewing and delivery of results has led to little "end-to-end integration" with results available for providers on a secure Web site or via clinical messaging. This approach still offers substantial benefits for the end user and is relatively easy and cost-effective to deploy, but it is far from the vision of full system integration.[55]
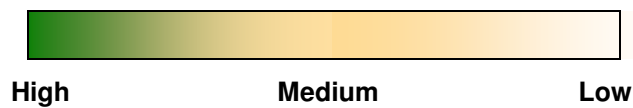
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[53] The Michigan Health Information Network Resource Center has compiled additional information regarding value propositions for various HIE services and is available online at
http://www.mihin.org/resources/HIE_Value_Propositions.pdf.
[54] J.Walker et al., "The Value of Health Care Information Exchange & Interoperability," *Health Affairs* (January 2005).
[55] Adler-Milstein, J., McAfee, A.P., Bates, D.W., and Jha, A.K. "The state of regional health information organizations: current activities and financing." *Health Affairs* (December 2007).

Benefit Potential

Service / Stakeholder	Clinical Results Delivery	Clinical Records	Care Management Tools	Quality Reporting	Public Health Reporting	Data Aggregation for Research	Personal Health Records
Physicians	Green	Green	Green	Green			Yellow
Hospitals	Green	Orange	Green	Green	Orange		
Laboratories	Green				Orange		
Pharmacies	Yellow						
Payers		Green	Green			Orange	Orange
Employers			Orange	Orange			
Researchers				Orange	Orange	Green	
Consumers		Orange	Yellow	Yellow			Orange

ANTICIPATED MAGNITUDE OF BENEFITS OF EACH SERVICE FOR STAKEHOLDER GROUPS[56]

High   Medium   Low

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[56] Adapted from *Massachusetts eHealth Collaborative* Presentation at AHRQ's 2007 Annual Meeting, September 26, 2007. Available online at http://www.ahrq.gov/about/annualmtg07/0926slides/tripathi/Tripathi.ppt.

Revenue Mechanisms
Revenue strategies for state-level HIE services remain a work in progress. All of the leading state-level HIE initiatives interviewed for this project continue to refine their business and implementation plans based on the applicability of various revenue mechanisms.

State-level HIE revenue strategies are often built around arrangements utilized by local HIEs, including: (1) subscription fees; (2) transaction fees; (3) service/cost sharing fee; (4) pay-for-performance models.[57]

Illustration of the key components of the state-level HIE financing framework

Subscription Fee. Data providers or data users pay fees to the HIE on a subscription basis. Subscriptions can be in the form of annual membership, monthly subscription, or specific set fees for services consumed (e.g., infrastructure management, applications – MPI/RLS, etc.). There may be fee levels (tiers) based on relative size (expenses or number of results delivered). In its 2008 survey of HIEs, the eHealth Initiative found subscription fees, reportedly utilized by 43% of the 42 operational HIEs, to be the most prevalent revenue mechanism.[58]

The Vermont Health IT Fund, used to support health IT and statewide HIE activities in Vermont, is based on a subscription model. Each health insurer operating in Vermont pays a quarterly fee in one of two ways: either by paying 0.199% of all health care claims paid for their Vermont members in the previous quarter, or a fee based on the insurer's proportion of overall claims in the past year.

One advantage to this approach is that it provides a more predictable cost for the member organization and a more predictable revenue stream for the HIE. Another advantage is that it avoids the need to track what can amount to millions of transactions a month and affixing charges to each transaction. As an accounting function, subscription fees, which can also be seen as membership dues, are less taxing than transactions fees and are not as susceptible to accounting error.[59]

Example of HIE incorporating subscription fees: Utah (UHIN).

Transaction Fee. Data providers or data users pay fees to the HIE based on transactional volume. This may include a tiered scale with volume discounts – lower fee per message delivered for higher volumes. A nominal, onetime start-up fee may also be charged. Organizations, individuals, or entities that use HIE services pay a pre-negotiated fee per transaction. Transaction fees may require minimum guaranteed transaction level for participating entities. Transactions could be represented by specific records retrieved or on a per-patient basis. Operationally, an advantage to this approach is that fees to support the HIE

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[57] For additional analysis of HIE revenue mechanisms, see AHIMA Foundation of Research and Education. *Report and Recommendations on Health Information Exchange Services That Are Financially Sustainable* (January 23, 2007). Available online at http://www.slhie.org/Docs/Tasks.13.pdf.
[58] eHealth Initiative. *Fifth Annual Survey of Health Information Exchange at State and Local Levels* (September 11, 2008). Available online at http://ehealthinitiative.org/HIESurvey/.
[59] The RHIO Wiki, Subscription Fee Models. Available online at http://www.socialtext.net/rhiowiki/, and accessed on October 14, 2008.

can be added to existing health care transactions. Another potential advantage is a lower up-front cost for participating organizations, though total cost (and revenue) may be harder to predict than other models.[60]

In California, the long-term sustainable funding model for CalRHIO consists of transaction fees charged to claims payers for each time a patient's information is queried in the system. According to CalRHIO, the fees, in addition to the larger funding, have been structured to avoid burdening early adopters with the financial burden of paying for the system.

Implementing CalRHIO's financing approach will not be without challenges.[61] For example, while CalRHIO will simplify some aspects of data gathering, many health insurance companies currently pay data transactional fees that are below $1 per transaction. The proposed CalRHIO fees of $25 are above the amount normally paid by insurance companies and could create concerns about their ability to pass costs through to customers in their pricing. With respect to the coding and billing, medical claims are classified by what are known as CPT codes. Claims payment systems are programmed to look for valid CPT codes when processing claims. Yet, at the current time, the CPT taxonomy lacks a code for looking-up or reviewing patients' health information via an HIE.

Other issues to consider include: (1) assignment of additional fees on transactions may discourage system utilization; (2) a critical mass of volume may be needed before revenue is generated; and (3) the challenge of developing billing mechanisms around the complex transactional models in health care.

>   *Example of HIE incorporating transaction fees: New England (NEHEN)*

Service/Cost Sharing Fee. Fees are charged or paid based on meeting certain milestones or cost savings for case management or coordination of care. Medicare Demonstrations, including the Medicare Health Support and Physician Group Practice Initiative, are two examples of payment systems whereby providers share in the generated savings. For HIE-enabled disease management programs, payers and purchasers pay HIE for delivery of disease management service on per member/per month basis.

One drawback to sustainability models built on cost sharing mechanisms is that data are needed to substantiate the projected cost savings. Some observers have noted that the data to demonstrate waste reduction and cost savings could take years to accumulate and analyze.

>   *Example of HIE incorporating service/cost sharing fees: Tennessee (CareSpark)*

Pay-for-Performance (P4P). HIE-enabled pay for performance models can be deployed in two ways: (1) through fees paid by insurers on per member basis, or (2) by insurers paying financial incentives to physicians and health systems for achieving certain healthcare-related quality measures. Many observers note that as incentive mechanisms built around quality measures increase, so too will the market for HIE.

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[60] Vermont Information Technology Leaders. *Vermont Health Information Technology Plan: Strategies for Developing a Health Information Exchange Network* (July 2007). Available online at http://www.vitl.net/uploads/1184614970.pdf.
[61] *Review of CalRHIO Proposal for CalPERS*. Mercer (March 5, 2008). Available online at http://www.calpers.ca.gov/eip-docs/about/board-cal-agenda/agendas/hbc/200803/item-4c-attach.pdf

Consider the emerging concept of the Patient-Centered Medical Home.[62] Physicians practicing within a Patient-Centered Medical Home framework have responsibilities (and are reimbursed for) coordinating patient care across their patients' different care environments. Under this model, one could reasonably expect that a physician would pay for the enabling infrastructure of HIEs; without it, his/her work would be far less efficient.[63]

Another payment reform model likely to stimulate demand for interoperable HIE are episode-based payments (e.g., Prometheus System) which pay doctors a set fee for the treatment of a given condition.[64] The fee is adjusted based on a patient's individual characteristics, and there's a warranty for care if complications arise. There's also an incentive for physicians who provide care that meets both quality and efficiency standards.

Example of HIE incorporating pay-for-performance: New York (THINC RHIO)

Sources of Revenue
As most state-level HIE efforts remain in their early developmental stages, very little is known regarding sources of revenue for ongoing statewide HIE. Like revenue mechanisms, many state-level HIEs, especially those in smaller states, draw on the experiences of local HIE and RHIOs regarding the viability of various revenue sources.

In its 2008 HIE survey, the eHealth Initiative found that sixty-two percent of operational health information exchange initiatives are receiving funds from hospitals to support ongoing operations, followed by physician practices (38%), the federal government (36%), private payers (29%), state government (26%), and public payers (24%).[65]

Illustration of the key components of the state-level HIE financing framework

Purchasers. While purchasers of health care, e.g., large employers, pension funds, have not been significant financial contributors to state-level HIE efforts, they have the ability, and in some cases demonstrated the willingness, to leverage their purchasing power to create demand for interoperable HIE. As noted above, the California Public Employees' Retirement System directed its health plans – Anthem Blue Cross (formerly Blue Cross of California), Blue Shield of California and Kaiser Permanente – to negotiate contract terms with CalRHIO.

As significant purchasers of health care for their employees, state, county and local governments can instigate a market for interoperable HIE. In Minnesota, health IT adoption and interoperability is being advanced through the state employee health plan. A recent law (MN HB 548, 2007) directs the State employee health plans to provide consumer-owned electronic personal health records that are portable among health care providers, health plan companies,

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[62] Additional details on the Patient-Centered Medical Home can be found online at http://www.medicalhomeinfo.org.
[63] Basch, P. "The Problem Is Not RHIOs, It's Sequencing And Business Case." *Health Affairs eLetter*. Available online at http://content.healthaffairs.org/cgi/eletters/hlthaff.27.1.w60v1.
[64] Additional details on the Prometheus System can be found online at http://www.prometheuspayment.org/.
[65] *eHealth Initiative*. "Fifth Annual Survey of Health Information Exchange at State and Local Levels." (September 11, 2008). Available online at http://ehealthinitiative.org/HIESurvey/.

and employers in order to control costs, improve quality, and enhance safety, and to demonstrate the feasibility of a statewide HIE.

In addition, both policy makers and purchasers are particularly interested in the role HIEs may be able to play in addressing limitations in existing quality reporting and P4P programs, which primarily rely on claims data. HIEs have the potential to reduce administrative costs and burdens by efficiently leveraging existing data to automate reporting. HIEs can improve quality measurement by incorporating clinical data with claims data across multiple payers.

Recognizing the value of leveraging HIE for quality reporting, local employers in Indiana collaborated with the IHIE to create Quality Health First program. Under the auspices of Quality Health First, IHIE provides reports on physician performance to participating physicians and health plans. Observers noted that the employer coalition was instrumental in getting health plans to participate in IHIE for the first time.[66] While IHIE's start-up costs were covered by philanthropic grants, health plans are expected to pay a per-member, per-month charge to cover operating costs and, potentially, some of the fixed costs for the underlying clinical data repository.

Payers. A number of state-level HIE efforts, including those in California, Delaware, Maine, and Rhode Island are negotiating with health plans to provide a consistent funding stream for utilization of state-level HIE services. Public sector payers are also being tapped to support ongoing statewide interoperability efforts: in Michigan, the state Medicaid agency is paying a fee to participate in the Capital Area RHIO.

Providers. In Tennessee, the eHealth Collaborative is exploring fee for service arrangements. In this model, authorized physicians would access the eHealth Exchange Zone and be offered a range of services and applications. Some core services would be free, whereas other "value-added" services would charge providers a fee for usage. For the ability to list their services on the eHealth Exchange Zone, vendors would pay a fee that would be used to offset the operating costs for the eHealth Exchange Zone.

Public Health. Public health can be a source of revenue for state-level HIE activities, typically through categorical funding to achieve specific program objectives. In a number of states, state-level HIEs will facilitate providers' submission of data to state-funded immunization and disease registries. In Maine, the state public health authority, Maine Center for Disease Control and Prevention, will pay HealthInfoNet $250,000 to implement and operate a statewide, automated laboratory reporting system.

Moreover, the federal government, a significant source of funds for many state and local public health initiatives, is placing increasing value on shared information technology infrastructure to support public health reporting and surveillance.[67] As a result, the Center for Disease Control and Prevention (CDC), has allowed state agencies to allocate funds for statewide HIE initiatives.[68]

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[66] Grossman, J; Kushner, K; November, E. "Creating Sustainable Local Health Information Exchanges: Can Barriers to Stakeholder Participation be Overcome?" *Center for Studying Health System Change* (February 2008). Available online at http://www.hschange.com/CONTENT/970/.

[67] Vermont Information Technology Leaders. *Vermont Health Information Technology Plan: Strategies for Developing a Health Information Exchange Network* (July 2007).

[68] For more details on CDC's support of health department's capacity to use and exchange information electronically, see the Public Health Information Network (PHIN) website at http://www.cdc.gov/PHIN/.

Research Organizations. As the organizations collecting health data embrace the commercial and public-health potential of the secondary uses, there is increasing recognition of the need for standards-based, interoperable systems and approaches that will facilitate aggregation of data to enable the creation of data sets of meaningful size and mix to support research and clinical needs.

Access to individual patient care data and the ability to query across large numbers of patients provide opportunities to improve clinical research, recruitment for clinical trials, and comparative effectiveness efforts. For example, the aggregation of EHR data will allow researchers to combine adverse event data (related to a product/procedure, a class of products/procedures, or a disease) to enable better identification of previously undetected patterns of safety events and/or co-morbidities, or drug-drug interactions.

Chartered Value Exchange: Officially designated by the Secretary for Health and Human Services, Chartered Value Exchanges (CVEs) are local collaborations of health care providers, employers, insurers, and consumers working jointly to improve care and make quality and price information widely available. CVEs have access to information from Medicare that gauges the quality of care that physicians provide to patients. These performance measurement results may be combined with similar private-sector data to produce a more comprehensive guide to the quality of care in these communities. (*Source*: US Department of Health and Human Services Value-Driven Health Care Home Page; http://www.dhhs.gov/valuedriven/index.html).

Electronic Health Record: An electronic record of health-related information on an individual that conforms to nationally recognized interoperability standards and that can be created, managed, and consulted by authorized clinicians and staff across more than one health care organization. (*Source*: US Department of Health and Human Services Office of the National Coordinator for Health IT Reports; http://www.hhs.gov/healthit/resources/reports.html).

Health Information Exchange: The electronic movement of health-related information among organizations according to nationally recognized standards. (*Source*: US Department of Health and Human Services Office of the National Coordinator for Health IT Reports; http://www.hhs.gov/healthit/resources/reports.html).

Interoperability: Interoperability means the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities. (*Source*: HIMSS Interoperability Definition; http://www.himss.org/content/files/interoperability_definition_background_060905.pdf).

Public Good: In economics, a public good is a good that is non-rivaled and non-excludable. This means, respectively, that consumption of the good by one individual does not reduce availability of the good for consumption by others; and that no one can be effectively excluded from using the good. Non-rivalness and non-excludability may cause problems for the production of such goods. Specifically, some economists have argued that they may lead to instances of market failure, where uncoordinated markets are unable to provide these goods in desired quantities. These issues are known as public goods and are related to the broader issue of externalities. (*Source*: Varian, H. *Microeconomic Analysis*. W. W. Norton & Co., New York, 1992.)

Public Instrumentalities: Instrumentalities denotes entities closely affiliated – generally by government ownership or control – with state or local governments.   Whether an entity is an "instrumentality" of a governmental unit is determined based on the following factors:
(1) whether it is used for a governmental purpose and performs a governmental function;
(2) whether it performs its function on behalf of one or more states or political subdivisions;
(3) whether private interests are involved, or whether states or political subdivisions have the powers and interests of an owner; (4) whether control and supervision of the organization is vested in public authority or authorities; (5) whether express or implied statutory or other authority is needed to create and/or use the entity; and (6) the degree of the organization's financial autonomy and the source of its operating expenses. (*Source*: Internal Revenue Service; http://www.irs.gov/pub/irs-tege/eotopice90.pdf.)

Public-Private Partnerships: Public-private partnership (PPP) describes a government service or private business venture which is funded and operated through a partnership of government and one or more private sector companies. (*Source*: Wikipedia; http://en.wikipedia.org/wiki/Public-private_partnership.)

Regional Health Information Organization: A health information organization that brings together health care stakeholders within a defined geographic area and governs health information exchange among them for the purpose of improving health and care in that community. (*Source*: US Department of Health and Human Services Office of the National Coordinator for Health IT Reports; http://www.hhs.gov/healthit/resources/reports.html.)

State Assessments: The primary objective of the special assessment, as in the case of taxes, is some common benefit and they are compulsory. Unlike taxes, which are paid without reference to specific individual benefits, special assessments are based on an anticipated benefit for a specific activity. In other words, whereas taxes are levied for general expenses, special assessment is for a definite purpose, which typically adds to the capital account of the government. (*Source*: A Planner's Guide to Financing Public Improvements; http://ceres.ca.gov/planning/financing/chap3.html.)

State Capital Budget: A state's capital budget provides for the acquisition or construction of major capital items, including land, buildings, structures, and equipment and requires multiple years for completion. Money for these projects is typically appropriated from funds whose revenue comes from bond sales. (*Sources*: State of Ohio, Office of Management and Budget; http://www.obm.ohio.gov/budget/capital/ and President's Commission to Study Capital Budgeting; http://clinton4.nara.gov/pcscb/staf_states.html.)

State Operating Budget: State's operating budgets are the annual/biennial budgets proposed by the governor and ratified by the state legislature. State operating budgets fund state agencies and programs during an agreed upon appropriations cycle. (*Source*: State of Minnesota, Office of Management and Budget; http://www.finance.state.mn.us/budget/operating/index.html.)

State Special Purpose Funds: Special purpose funds are used in this report to describe funding sources that are not subject to the traditional legislative appropriation process. Examples of special purpose funds include tobacco settlement funds and federal Medicaid waivers.

NAME	TITLE/ORGANIZATION
Interviewees	
Laura Adams, MS, RN	*President and Chief Executive Officer* Rhode Island Quality Institute
Martin Ciccocioppo, MBA, MHA	*Chairman of the Board* Pennsylvania eHealth Initiative
Devore Culver, MA	*Executive Director* HealthInfoNet
Vicki Estrin	*Regional Informatics Program Manager* Vanderbilt Center for Better Health
Lori M. Evans, MPH, MPP	*Deputy Commissioner* Office of Health Information Technology Transformation New York State Department of Health
Erin Grace	*Senior Manager, Health IT Portfolio* US Department of Health and Human Services Agency for Healthcare Research and Quality
Melissa Hargiss	*Acting Director* Tennessee e-Health Advisory Council
James Hester	*Director* Vermont Health Care Reform Commission
Don Holmquest, MD, PhD, JD	*Chief Executive Officer* CalRHIO
Beth Nagel, MA	*Health Information Technology Manager* Michigan Department of Community Health
William O'Byrne	*State e-Health IT Coordinator* New Jersey Department of Banking and Insurance
Stephen Palmer	*Senior Policy Analyst* Texas Health Care Policy Council Office of the Governor
Gina Perez	*Executive Director* Delaware Health Information Network
Jody Pettit, M.D.	*Former Health Information Technology Coordinator* Office for Oregon Health Policy and Research
Anthony D. Rodgers	*Director* Arizona Health Care Cost Containment System
Lemuel C. Stewart, Jr.	*Chief Information Officer* Commonwealth of Virginia
Christopher B. Sullivan, Ph.D.	*Administrator* Florida Center for Health Information and Policy Analysis Agency for Health Care Administration
Dick Thompson	*Chief Information Officer* State of Maine

NAME	TITLE/ORGANIZATION
Advisory Panel	
Shaun T. Alfreds MBA, CPHIT	*Senior Project Director* University of Massachusetts Medical School Center for Health Policy and Research
Douglas W. Emery, MS	*Director of Payment Policy* eHealth Initiative
Steven Fox	*Vice President of Provider Network Management* BlueCross BlueShield of Massachusetts
Joseph Ray, BS	*Senior Manager Manatt Health Solutions* Manatt Health Solutions
Lonny Reisman, MD	*Chief Executive Officer and Director* ActiveHealth Management

1. FORMATIVE STAGE			
Summary	**Governance Activities/Milestones**	**Financial Activities//Milestones**	**Technical Activities//Milestones**
Overview: An awareness stage. State-leadership recognizes the need for health IT and/or health information exchange in the state.	Formative Activities − Informal stakeholder discussions and meetings occurring	Formative Activities − Assess financing options for sustain statewide HIE governance and technical operations begun	Formative Activities − Begin catalogue and assessment of HIE activities in state
Milestone for transition to next stage: Designation of state-level HIE initiative with statewide purview	Foundational Milestones − Authorization legislation *may* have been introduced (not passed)	Foundational Milestones − Appropriations legislation *may* have been introduced (not passed)	Foundational Milestones − Regional, local HIE *may* be occurring

2. FOUNDATIONAL STAGE			
Summary	**Governance Activities/Milestones**	**Financial Activities/Milestones**	**Technical Activities/Milestones**
Overview: Entity, initiative, or advisory body with statewide purview has begun deliberations. Planning for governance, financing, and technical components is underway.	Foundational Activities – Statewide convening and coordinating functions occurring – Planning for privacy, policy and accountability components for statewide interoperability begun	Foundational Activities – Conduct detailed assessment of stakeholder's value proposition and cost modeling for potential services.	Foundational Activities – Assess HIE stakeholders, resources, and statewide HIE technical capacity
Milestone for transition to next stage: Statewide HIE plan completed and has been communicated to the public.	Foundational Milestones – A governing body identified or appointed, with operating committees established – State legislation has been passed, an executive order issued, or some other state action taken which calls for some level of activity related to health IT and/or health information exchange. – State government designates personnel to guide, support, or participate in state-level HIE initiative	Foundational Milestones – Funding for statewide convening & coordinating elements _secured_ (either appropriations passed or stakeholder funds committed). – Funding for development of statewide HIE infrastructure and/or pilot projects _identified_.	Foundational Milestones – Stakeholders agree on technical design & approach to deliver statewide interoperability. – Request for Proposals for technical implementation developed and released.

3. IMPLEMENTATION STAGE			
Summary	**Governance Activities/Milestones**	**Financial Activities/Milestones**	**Technical Activities/Milestones**
Overview: Initial governance, financing, and technical implementation begun. Some of the key roadmap implementation steps have been undertaken.	Implementation Activities – Governance entities overseeing development & implementation of state-level HIE effort	Implementation Activities – Finalize contractual requirements and funding mechanisms for governance and technical infrastructures – Assess financing options to develop and sustain statewide HIE technical operations.	Implementation Activities – Develop technical infrastructure and/or regional HIE capabilities – Develop legal and policy arrangements (e.g., business associate agreements, and other , legal arrangements, and policy
Milestone for transition to next stage: Live exchange of clinical health information	Implementation Milestones – Key components of privacy, policy and accountability framework in place	Implementation Milestones – Funding for statewide HIE technical infrastructure and/or pilot projects *secured*.	Implementation Milestones – For state-level HIEs implementing statewide HIE services, vendor selected and development underway. – Pilots projects launched and operational. – Components of statewide HIE technical infrastructure in development.

4. OPERATIONAL STAGE			
Summary	**Governance Activities/Milestones**	**Financial Activities/Milestones**	**Technical Activities/Milestones**
Overview: A fully functioning state-level HIE is fulfilling either governance and/or technical operation roles, and exchange of clinical data is occurring in accordance with published plan.	Operational Activities – Governance entities overseeing development & implementation of state-level HIE effort Operational Milestones – Lead entity (e.g., state agency, state instrumentality, indep public/private partnership) actively conducting statewide convening and coordinating functions. – Key features of privacy, policy and accountability framework in place and operational	Operational Activities – Financing options to sustain statewide HIE operations identified and agreed upon Operational Milestones – Funding for statewide HIE sustainability _secured_.	Operational Activities – Exchange of live data in accordance with technical plan. Operational Milestones

State	Implementation Timeline and Phases
State: **Arizona** *Name of Document*: Arizona Health-*e* Connection Roadmap *Date Released*: April 2006	**5 Years** *Year 1*: Establish governance body; develop business plan; participation agreements; medical trading area approach, establish the first MTA information exchange with a results delivery service; develop Arizona's statewide Web portal with security infrastructure components; pilot a basic patient health summary; establish HIT adoption plan; market to and educate the healthcare community *Year 2*: Provide guidance to first MTA information exchange for enhanced services; establish other MTA information exchanges with results delivery service; implement secured messaging; obtain Health-e Connection outcome measurements; encourage HIT adoption *Year 3*: Establish and provide guidance to MTA information exchanges with results delivery services; enhance the patient health summary with data from MTAs; enhance public health functions; obtain Health-e Connection outcome measurements; encourage HIT adoption *Year 4*: Establish and provide guidance to MTA information exchanges with results delivery services; enhance the patient health summary with data from MTAs; implement statewide patient locator; develop statewide personal health record access; obtain Health-e Connection outcome measurements; encourage HIT adoption *Year 5*: Enhance the patient health summary with data from MTAs; add functions for oral health and other healthcare professions; obtain Health-e Connection outcome measurements; encourage HIT adoption
State: **California (CalRHIO)** *Name of Document*: CalRHIO presentation for CMS eRx Conference *Date Released*: October 2008	**7 Years** *Months 0-3*: Signing of participation agreements / MOUs with Health Plans triggers funding for Phase I *Months 4-12*: Phase 1 for statewide on-demand data service (Lab/RX/Claims) begins; system live by Month 12, and charges begin for medical history queries by EDs for lab, pharmacy, and claims data. *Month 15*: Phase 2 for the addition of local data sources & more services begins *Year 2*: Charges for queries by physician offices start *Year 3*: Phase 1 complete; permanent financing obtained to complete Phase II; *Year 7*: Phase 2 complete; Electronic medical data available for 90% of Californians; System supported by all who derive business value from use of the utility.

State	Implementation Timeline and Phases
State: **Georgia** *Name of Document*: Georgia Health Information Technology and Transparency (HITT) Strategic Plan *Date Released*: February 2008	**10 Years** *Year 1*: Create governance infrastructure; fund local HIE planning and implementation efforts. *Year 2*: Monitor the progress of the 4 HIE Grantees, promote the development of private and secure health information exchanges among HIE grantee collaborations; Prioritize statewide HIE activities such as e-prescribing, electronic personal health records, electronic medical records, in accordance with Federal HIE initiatives; create financial sustainability model; conduct HIE outreach and education. *Years 3-5*: Promote the adoption of personal health records; Continue to maintain and promote the HIE; Create infrastructure for telemedicine *Year 10*: Achieve universal e-prescribing for the state; Achieve and maintain HIT initiatives including an interoperable HIE system for the state.
State: **Vermont** *Name of Document*: Vermont Health Information Technology Plan: Strategies for Developing a Health Information Exchange Network *Date Released*: July 2007	**5 Years** *Year 1*: Initial components of the infrastructure will be deployed and operational, including building interfaces to enable lab test results to be sent electronically from a hospital to a physician EHR system. *Year 2*: The statewide HIE network will provide data services to populate PHRs and support public health reporting. *Year 3*: Interfaces will be built to allow continuity of care documents (clinical summaries in a standard format) to be transmitted to and from hospitals. The statewide HIE network will provide data services to support passive public health surveillance. *Years 4-5* : Incrementally build additional components of the architecture which will become operational as new applications and data services are implemented.

	AHRQ/ONC *Health Information Security and Privacy Collaborative Contract*	**AHRQ** *State Regional Demonstration Contract*	**CDC** *HIE Biosurveillance Program Contract*	**CMS** *Medicaid Transformation Contract* (HIE-focused)	**ONC** *NHIN Trial Implementation Contract*
AL	●			●	
AK	●				
AZ	●			●	
AR	●				
CA	●				●
CO	●	●			
CT	●				
DE		●			●
DC				●	
FL	●				
GA				●	
HI				●	
ID			●		
IL	●				
IN	●	●	●	●	●
IA	●				
KS	●				
KY	●			●	
LA	●				
ME	●				
MD					
MA	●				
MI	●				
MN	●			●	
MS	●			●	
MO				●	
MT				●	
NE					
NV					
NH	●				
NJ	●				
NM	●			●	●
NY	●		●		●
NC	●				●

	AHRQ/ONC *Health Information Security and Privacy Collaborative Contract*	**AHRQ** *State Regional Demonstration Contract*	**CDC** *HIE Biosurveillance Program Contract*	**CMS** *Medicaid Transformation Contract* (HIE-focused)	**ONC** *NHIN Trial Implementation Contract*
ND					
OH	●				
OK	●				
OR	●			●	
PA					
RI	●	●		●	
SC					
SD					
TN		●			●
TX				●	
UT	●	●			
VT	●				
VA					●
WA	●		●		
WV	●			●	●
WI	●			●	
WY	●				