

Central Data Repositories and the Power of Advanced Data Mining

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Learning from Harrah's!?



Customer experience improved while at the casino

- What's this customer's past spending history
- What's the loss threshold?

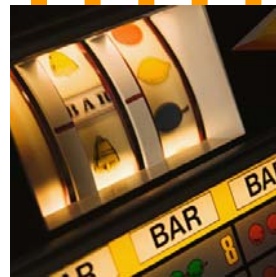
- Is customer approaching his max loss?
- What offers are available?

Send offer to floor Luck Ambassador to convey to the customer

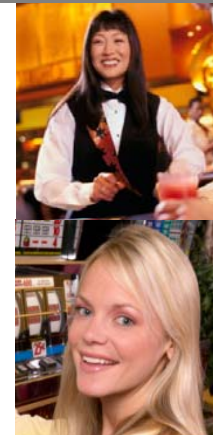
(Later)
Marketing



1. Customer inserts Total Rewards Card at Slot Machine



2. Customer wins or loses, a little or a lot



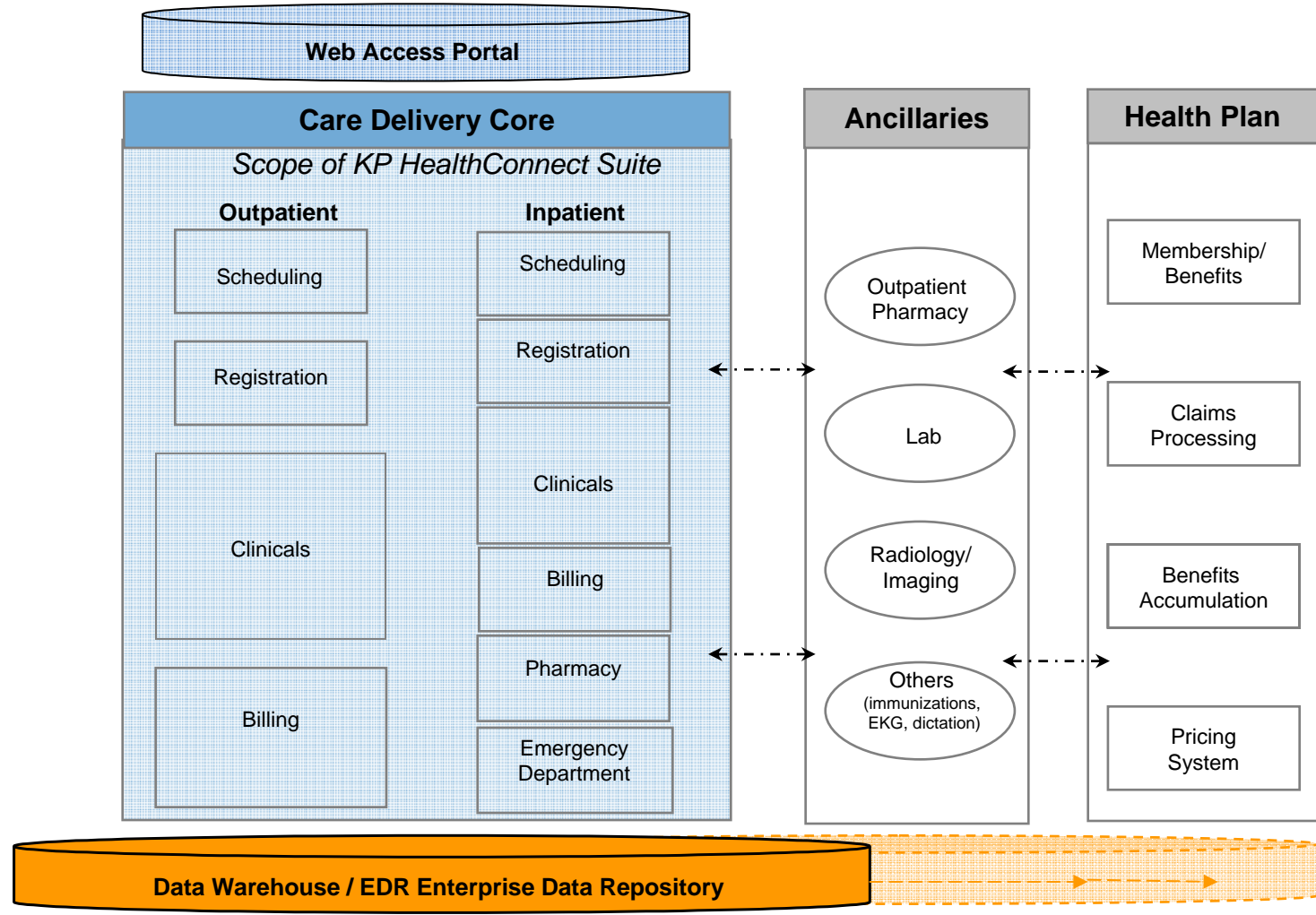
3. Customer leaves (happier)



4. Customer gets add'l incentive

...

Architecture



Building Better EMR

Gartner

Publication Date: 1 November 2006

But what about health information exchanges?

Findings: Data Warehousing Essential for Clinical Application Portfolios

Barry R. Hieb, M.D., Thomas J. Handler, M.D., Barry Runyon

Although many care delivery organizations have implemented computer-based patient record systems, they recognize that they must add data warehouses to appropriately support advanced analytics and decision support.

Most large care delivery organizations (CDOs) have installed computer-based patient record (CPR) systems, resulting in a flood of clinical information. However, the CPR is not an appropriate platform for the business intelligence (BI) tools needed to analyze this information. BI analysis is essential for CDOs to institute effective clinical quality improvement programs.



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Agenda



- **Introduction**
 - > Healthcare in Dayton, OH
 - > WSU Center for Healthy Communities
 - > HealthLink RHIO
 - > HIEx™ Application
- **Building Blocks for Decision Support Systems (DSS) Capability**
 - > Inter-personal / Inter-organizational
 - > Legal
 - > Business Model
 - > Technical
- **Projects and Results**
 - > Demographic measurement
 - > Quality measurement and improvement
 - > Efficiency measurement and improvement
- **Conclusions and Lessons Learned**



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Dayton, OH – Our Community



Demographics

- 559K metro area (Montgomery County)
- 158K in City of Dayton
- 6.5%+ unemployment in Montgomery County
- 18% uninsured
- Wright Paterson AFB



Healthcare System

- 2 Major Hospital Systems (both Not for profit)
- Safety net hospital closed & Specialty Heart Hospital opened
- Medicaid Managed Care
- VA

Children

- 25% of population under 18 years old
- 16,000 students Dayton Public Schools
 - > 90% school lunch program eligible
 - > 70% estimated to be Medicaid eligible



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WSU Center for Healthy Communities



- Community-academic partnership established 1991
- Committed to:
 - > Improving the health and well-being of the community
 - > Educating its health professionals and
 - > Serving as a force for change
- Strong relationships established between community partners
 - > Identify issues to be addressed
 - > Work to identify and mobilize necessary resources for improving the health of the community and to better prepare tomorrow's health care professionals



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HealthLink RHIO



- Convene healthcare stakeholders in community
- Connected with Boonshoft School of Medicine
- RHIO is a means to an end
- “What if we had access to this information?”

Members are key staff from:

- WSU
- Public Health
- Dayton Public Schools
- Montgomery County Medicaid
- Medicaid Managed Care
- Safety Net Organizations
- Researchers
- VA
- Local employers (e.g. NCR)

Mission: Promote universal access and care coordination to the uninsured and marginally insured in the Greater Dayton Region to value-driven health care including the enhancement of a community-wide information network. Universal access will be accomplished as a self-sustaining process through local collaboration.



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HIE Application



HealthLink Information Exchange™ (HIEx™)

Home Support My Tasks Search Household

Alerts Appointments Contacts Demographics Dental Documents History Immunizations Medical Equipment

Medications Notes Problems Procedures Results Vitals HIPAA Admin Individual Clinical Problems

Welcome Mary M Crimmins | HIEx™ Home | HLMV Home | ©2002-2007 WSU

Summary for 'John Doe' (ID=55229)...

Person alerts...

Alerts		Allergies		Diagnosis	
Date	Description	Date	Description	Date	Description
No records returned.					
01/01/1900		01/01/1900	SEVERE REACTION - MORPHINE ALLERGY	01/01/1900	ANGINA
				01/01/1900	BP+ - HYPERTENSION

Individual Problems

Cmd	Type	Status	Problem Description	Comments	Latest Episode	Follow Up	Follow Up Reason	Updated	Updated by
/	Complaint		ACUTE CHEST PAIN	pain started last night and has grown worse. Reported at 8				03/05/2007	Mary M Crimmins
/	Complaint		[D]SHORTNESS OF BREATH	started this morning after his first cigarette				03/05/2007	Mary M Crimmins
/	Complaint		[D]NAUSEA	started this morning				03/05/2007	Mary M Crimmins
/	Diagnosis		ANGINA	PCP called to verify Pt report				03/05/2007	Mary M Crimmins
/	Problem		SMOKER					03/05/2007	Mary M Crimmins
/	Diagnosis		BP+ - HYPERTENSION	usually controlled				03/05/2007	Mary M Crimmins
/	Allergies		MORPHINE ALLERGY	severe reaction				03/05/2007	Mary M Crimmins

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Developed by WSU to provide:

- cost effective tool to improve access to care
- a way to capture and present essential patient data to healthcare providers, across care settings
- improved access to health care for families and children
- Web based
- Accessed using a VPN
- Role based access
- Full HIPAA audit trail
- Uses web services
- Currently data for 40,000 people
- 100% of children in DPS

Returned: 7 records.

Problem Lookup Service

Query Problem Wide

Name UMLS SNOMEDCT ICD9CM

Query UMLS

Terminology Services
 HIEx provides terminology services in order to improve the quality, comparability and accessibility of clinical information. Every effort has been made to ensure accuracy. However, no liability or warranty for errors or omissions exists, expressed or implied.

Vocabulary
 User-defined online content is provided by the HIEx Member...



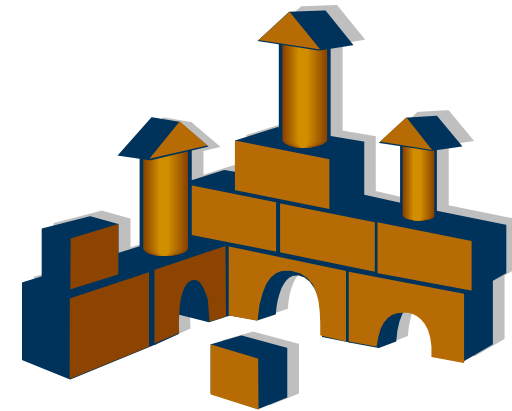
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Building Blocks for DSS Capabilities



- Inter-personal / inter-organizational
- Legal
- Business model
- Technical



...or how to prevent building something you can't use!

Inter-Personal / Inter-Organizational



Center for Healthy Communities

- Trusted third party
- Not allied with care delivery organizations or payers
- Research ties with:
 - > State Medicaid
 - > Dept of Mental Health
 - > Dayton City Schools
 - > County Human Services
 - > Safety Net Providers
 - > Public Health
 - > Community Health Advocates
 - > Other nascent exchanges!



Trust is the foundation of Health Information Exchange!



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Inter-Personal / Inter-Organizational



Convened HealthLink Miami Valley

- Recruited “portal” agencies
- Focus on shared challenges before IT
- Regular meetings, public website, no limitation on (free) membership
- Consensus-driven governance (everyone has a veto!)
- Transparent funding
- Non-compete for local money
- Agreement not to sell or share data without informed consent
 - > Specified use
 - > Agreed priority of projects



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Guidelines

- HIPAA ↔
- State (OH) ↔
- Markle ↔
- NIH ↔
- Local (WSU) ↔

Actions

- Encryption, role-based security, audit trail
- Key participants in OH HISPC project
- Data sharing, specified use agreements
- IRB Review, Privacy Release Documentation
- Patient identification process
- Data source documentation
- Legal review by WSU

Rules for data aggregation, sharing, and sales!

Business Model



Focus on Low Cost and Minimal Burden to Drive Adoption and Use

- Public Utility
- Open source whenever possible (shared development)
- EHR and health information exchange in same application
- Additional service contracts (eligibility, eRX)
- Minimize burden of data collection
- Leverage existing IT resources
- Locally owned, operated, delivered



Funding coming from:

- Grants (WSU, Physicians Charitable Trust)
- User subscriptions
- WSU Boonshoft School of Medicine
- Subscriptions from Homeland Emergency Learning and Preparedness Center (H.E.L.P.)

Business Model



Focus on delivering value to community stakeholders

- Sustainability inherent to ASP design
- Prioritize addressing shared challenges (prioritized by user group)
- DSS Emerged as a priority: “Help us answer some questions!”
- Public Utility model
- Enlightened self-interest, the first “ask”
 - > Schools – Help us keep students in school by improving immunization reports
 - > H.E.L.P. Center – Help us track and report on patient care
 - > County Medicaid- Help us improve enrollment
 - > Hospitals- Help us reduce un-reimbursed care
 - > Medicaid Managed Care – help us manage mandated service requirements (WellChild physicals, immunization); help us improve reportable quality and health status data
 - > Local safety net providers – help us determine eligibility and do better case management
 - > Local providers – Help us check eligibility



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Business Model



Focus on delivering value to community stakeholders

- Enlightened self-interest is rewarded
 - > Schools- Help us share information with providers to improve the health of the student population
 - > Local providers- Help us improve the quality and economics of care
 - > State Medicaid – Help us increase enrollment and reduce duplication
 - > Boonshoft School of Medicine- Help us develop a mechanism for translational research
 - > Medical researchers– Help us save research money (build once; use many) adapt the system for special services
 - > Other services – Help us negotiate a favorable contract with HIT vendors for shared services, specifically payer eligibility with HTP Inc. for MedRunner™
- Converting data into knowledge
- Clinical trial recruitment
- Pediatric research
- Payer demographic data sharing to improve efficiency



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Technical



- Architecture
- Data Standards
- Data Sources
- DSS Tools

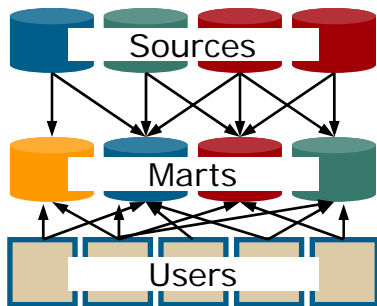


Pro's and Con's of Different Architectural Approaches...

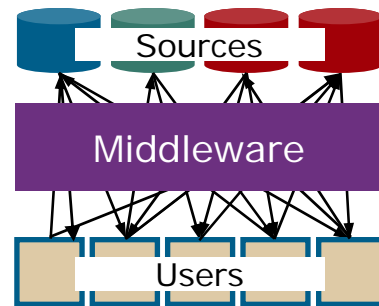
"Begin with the end in mind."

– Stephen Covey

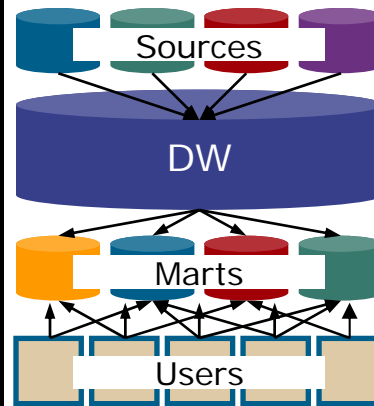
Data Mart-Centric



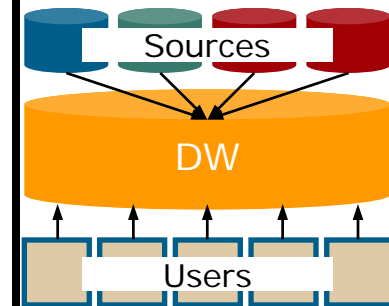
Virtual, Federated or Distributed



Hub-and-Spoke



Centralized



Independent Data Marts

Leave Data Where It Lies

Hub-and-Spoke Data Warehouse

Centralized Integrated Data With Direct Access

Pros

- Easy to Build Organizationally
- Limit Scope
- Easy to Build Technically

- No need for ETL
- No need for separate platform

- Allows easier customization of user interfaces and reports

- Single Enterprise "Business" View
- Data reusability
- Consistency
- Low Cost of ownership

Cons

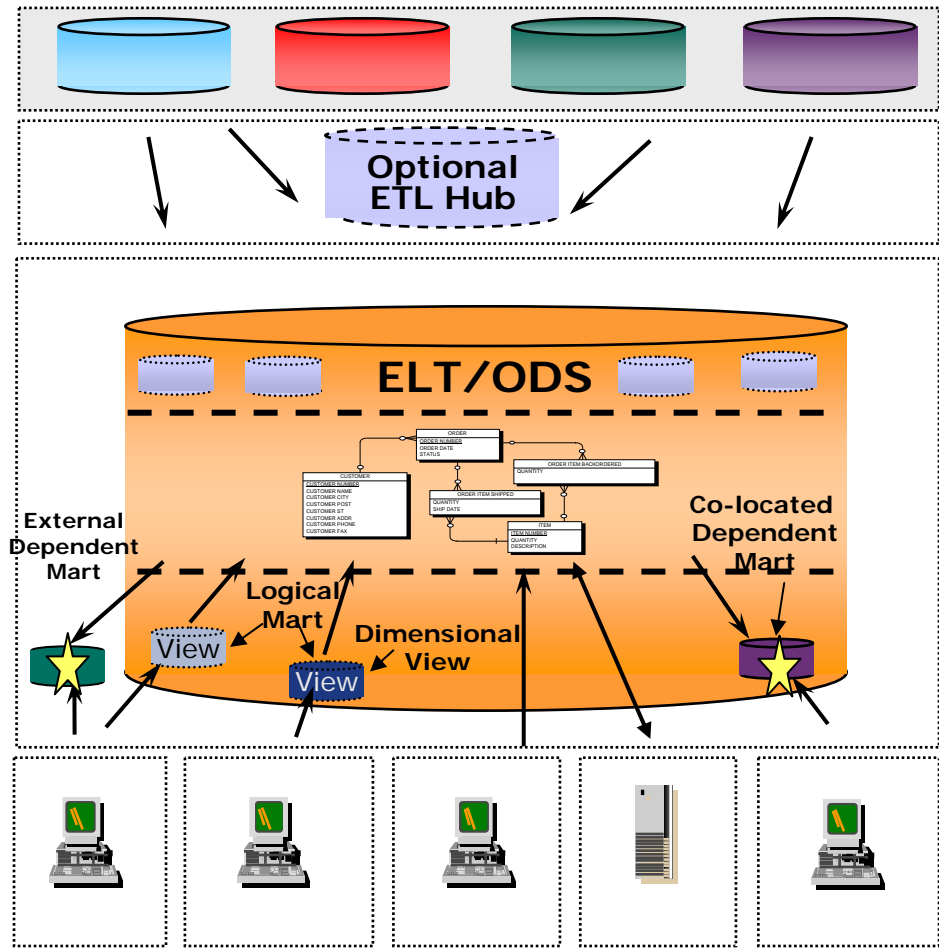
- Business Enterprise view unavailable
- Redundant data costs
- High ETL costs
- High App costs
- High DBA and operational costs

- Only viable for low volume access
- Meta data issues
- Network bandwidth and join complexity issues
- Workload typically placed on workstation

- Business Enterprise view challenging
- Redundant data costs
- High DBA and operational costs
- Data latency

- Requires corporate leadership and vision

Architecture: Centralized Topology

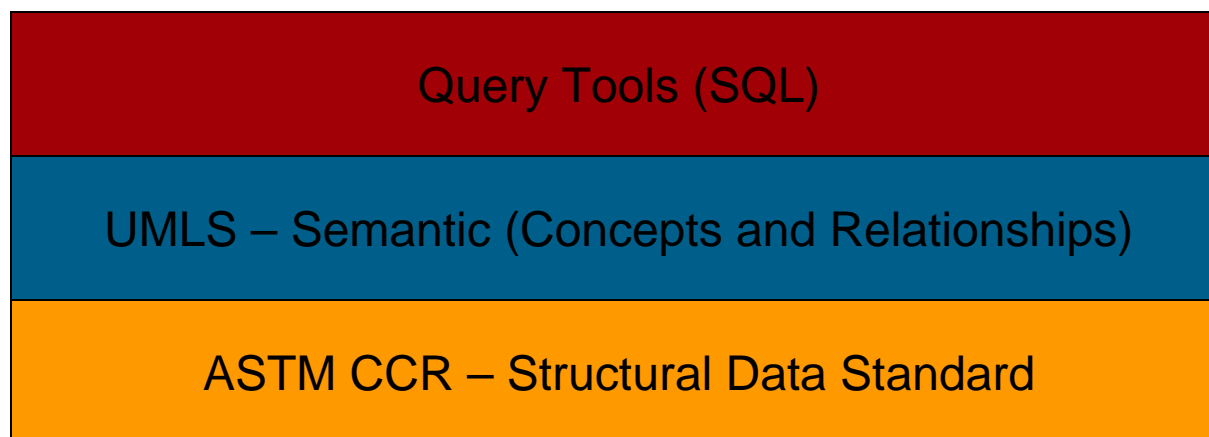


- Storage of all data
- Detail level
- Scalable database technology
- Logical (3NF) data model
- Physical and virtual views
- “Centralization to the highest level politically feasible”

Technical – Data Standards

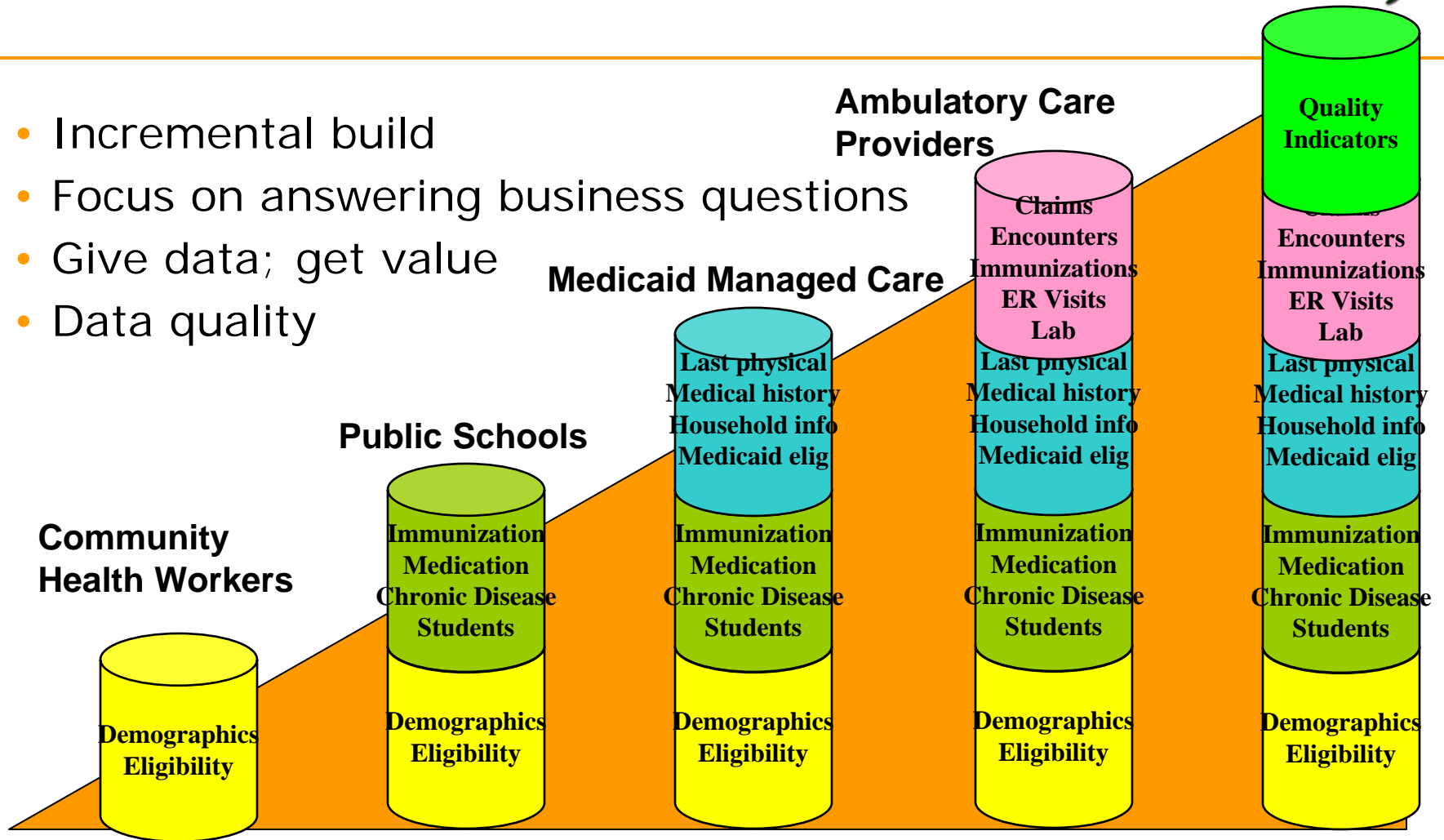


- Messaging and DSS are different animals!
- Structural + semantic data standards + quality checks
- ASTM CCR
- UMLS & SNOMED



Technical – Data Sources

- Incremental build
- Focus on answering business questions
- Give data; get value
- Data quality



Technical – DSS Tools



HIEx™ Application

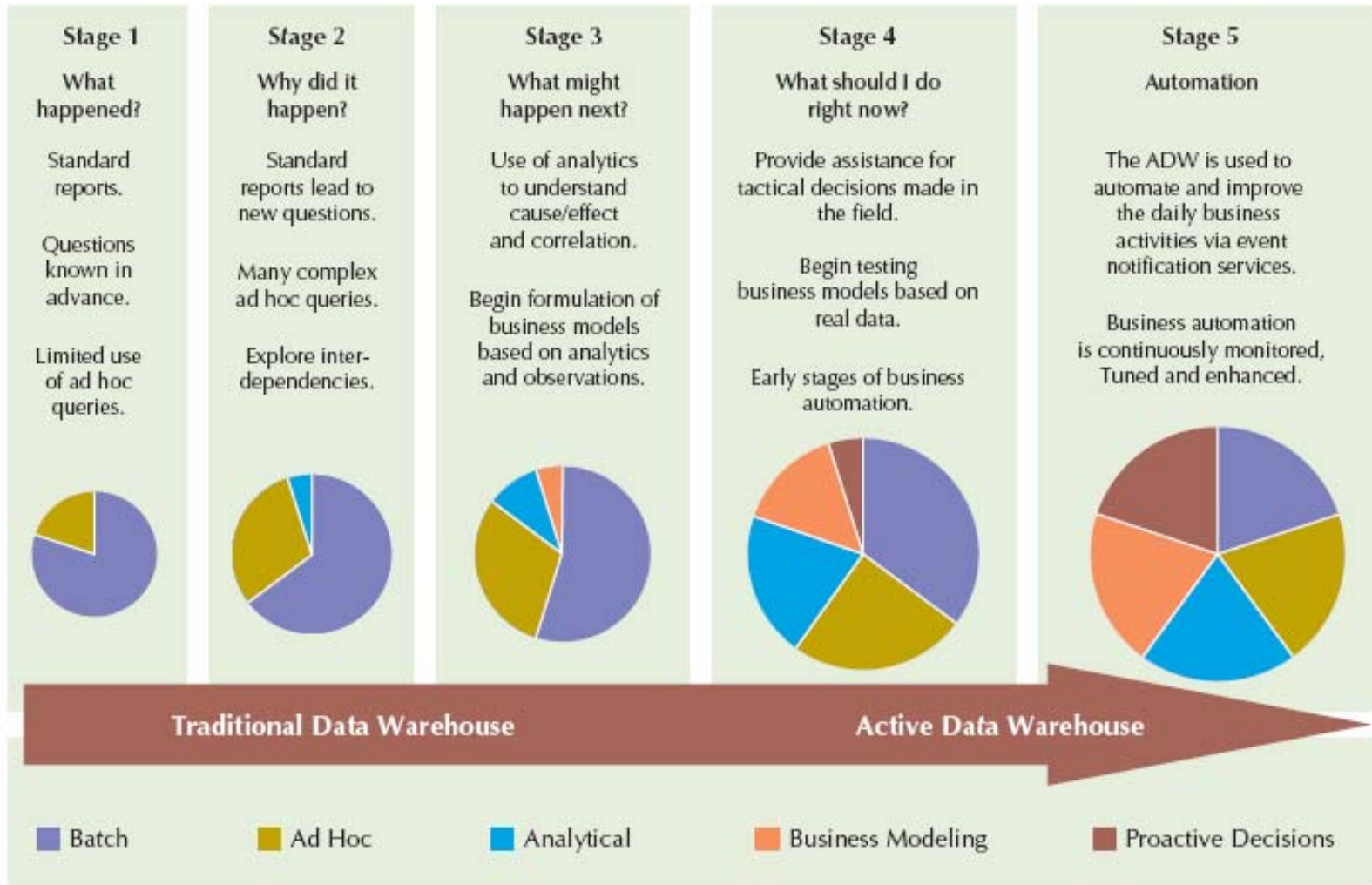
- Off-the-shelf reports
 - > Driven by user community
 - > Easy to use
 - Demographic reports
 - Data quality reports
 - Audit log reports
 - Service utilization reports
- Parameterized Reporting Functions
 - > Isolate all services for an individual or household
 - > Query by parameters
- Advanced data mining supported directly from database
 - > All data for all patients at the detail level
 - > Use of a variety of data analysis tools (SAS, SPSS, Warehouse Miner)
 - > Planned development of predictive models



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Technical – DSS Tools



Projects and Results



- Demographic measurement
 - > Most complete analysis of DPS students to date
 - 30% asthma
 - 90% have had a physical in the last year
- Quality measurement and improvement
 - > Measuring key Medicaid quality indicators
 - Diabetes
 - AHRQ grant application to expand project
- Cost & Efficiency measurement and improvement
 - > Lack of immunization records results in repeated immunizations
 - > “Service utilization patterns of prisoners, homeless and uninsured residents as evaluated through community wide data sharing” presentation at American Public Health Association (APHA) Annual Meeting
 - > “Patient tracking across organizations and care settings using a standards based CCR model system”

Projects and Results



Focus: Improved quality of care for children

- Who is eligible for Medicaid?
- Who has access to care?
- What is the quality of care?
- How care setting transitions are managed?
- What is the rate of over-exposure to immunizations?
- What is the rate of completed physical exams?



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Future Analytics and Projects



- Medical School Research
- Pediatric Research & Clinical Trial Recruitment
- Homeland Security / Bio-Surveillance
- Predictive Modeling



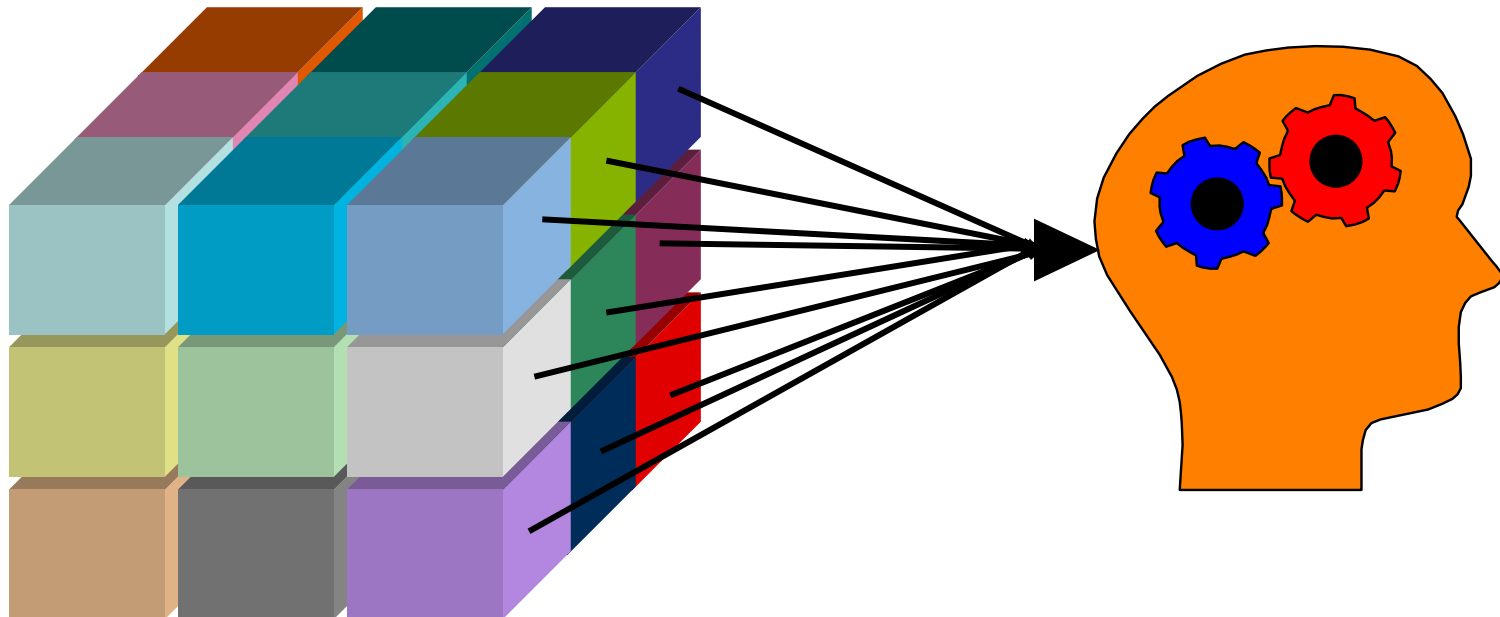
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Conclusions and Lessons Learned



- Maintain trust and links to users
- Prioritize value: ask people what they'll pay for!
- Platform scalability is key
- Build once; use many



Contact Information



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