Systematic Approach to Analysis of Immunization Information Systems Operations and Processes

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Problem

Differences in processes among immunization information systems (IIS) affect the consistency and quality of data used for public health decision making.

Solutions/Methods

Utilization of Systems Analysis and Business Modeling techniques to develop best practices for Public Health operations and processes

Results

Best Practices Recommendations

Abstract

Objectives: This presentation will illustrate the systematic methods the authors used to describe best practices for common operations and processes in immunization information systems (IIS). The proposed approach utilizes business modeling techniques in collaborative settings to analyze current practices and document consensus-based best practices recommendations. The alignment of operations and processes along recommended best practices improve consistency and comparability of IIS data.

Methods: Systematic business modeling techniques were used to support analysis of IIS operations. This resulted in the development of best practices documented through business rules, operational scenarios, and diagrams reflecting process, organizational, and informational aspects. The facilitation techniques were used to support collaborations and consensus building among contributors in face-to-face and web-based teleconference settings.

Results: The presented collaborative approach has been used repeatedly to elicit and document best practice recommendations in immunizations information systems (IIS). Case studies for various aspects of IIS operations, such as management of patient's immunization status, vaccination level deduplication, and data quality assurance will be presented.

Conclusions: Implementation of a collaborative business modeling approach to develop best practice recommendations for public health systems promotes alignment of operations and processes along collaborative, consensus-based guidelines. Our experiences support effectiveness of this approach in immunization tracking settings. The methods and processes used in this analysis may be adopted as PHIN guidance for soliciting and modeling operational needs and requirements for some public health information systems.

Relevance to PHIN

The methods and processes used in this analysis may be adopted as PHIN guidance for soliciting and modeling operational needs and requirements for some public health information systems. The use of subject matter experts, facilitation and business modeling techniques, promotes best practices, operational knowledge, and consistent use of quality data across a variety of interrelated public health functional needs.

Selected References

Williams W, Lyalin D, Wingo PA. Systems Thinking: What Business Modeling Can Do for Public Health. *Journal of Public Health Management and Practice*. 2005; 11(6): 550-553.

Williams W, Lowery E, Lyalin D, Savage R. Experts recommend: best practice operational guidelines for immunization information systems. 42nd National Immunization Conference, March 17-20, 2008; Atlanta, Georgia.

Williams W, Lyalin D, Savage R, Lowery E. The Business of IIS: Developing Consensus-Based Best Practice Guidelines for Improving IIS Operations. Workshop. 41st National Immunization Conference, March 2007; Kansas City, Missouri.

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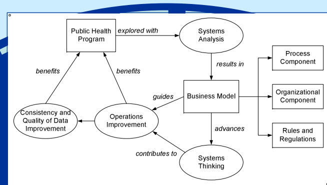
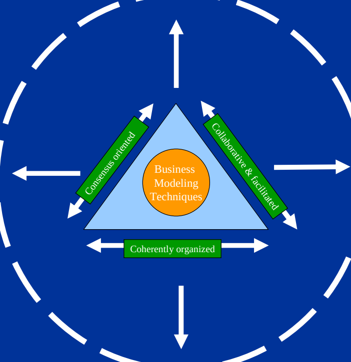
Implementation Background

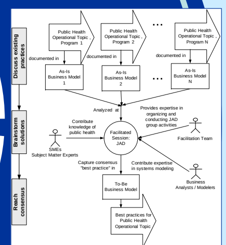
CDC, in collaboration with the American Immunization Registry Association (AIRA), convened the Modeling of Information Registry Operations Workgroup (MIROW) to systematically analyze operational aspects of Immunization Information Systems (IIS) and focus on technology- neutral operational needs and business/operational level best practice specifications.

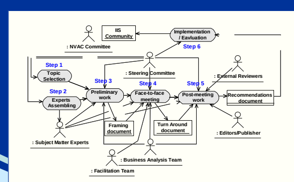

Public Health Program
explored with
Systems Analysis
results in
Process Component
Organizational Component
Rules and Regulations
benefits
benefits
guides
Business Model
Consistency and Quality of Data Improvement
Operations Improvement
advances
contributes to
Systems Thinking



Collaboration and consensus are "must have" in Public Health settings - due to a distinctive combination of business characteristics:

- Different PH programs and systems are multilevel hierarchies: federal, state, local levels
- Top to down "Command and Control" strategy can not typically be used (voluntary compliance)
- Common approaches have to be decided by representative Committees
- Partners often involved on a volunteering basis

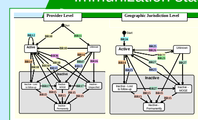

Discuss existing practices
Brainstorm solutions
Reach consensus
Public Health Operational Topic: Program 1
Public Health Operational Topic: Program 2
Public Health Operational Topic: Program N
As-Is Business Model 1
As-Is Business Model 2
As-Is Business Model N
Facilitated Session: JAD
SMEs Subject Matter Experts
Facilitation Team
Business Analysts / Modelers
To-Be Business Model
Best practices for Public Health Operational Topic


IIS Community
Implementation / Evaluation
: NVAC Committee
Step 1
Topic Selection
Step 2
Experts Assembling
Step 3
Preliminary work
Step 4
Face-to-face meeting
Step 5
Post-meeting work
Step 6
: Steering Committee
: External Reviewers
Recommendations document
Framing document
Turn Around document
: Subject Matter Experts
: Editors/Publisher
: Business Analysis Team
: Facilitation Team

Developed Best Practice Guidelines for IIS

- 2007: Data Quality Assurance in Immunization Information Systems: Incoming Data.
- 2006: Vaccination Level Deduplication in Immunization Information Systems.
- 2005: Management of Moved or Gone Elsewhere (MOGE) Status and other Patient Designations in Immunization Information Systems.
- 2004-2005: (Pilot) IIS-VAERS Collaboration For Vaccine Adverse Events Reporting.
- Recommendations documents are available for download at the AIRA web site www.immregistries.org

Patient's immunization status



Business rules

Nbr	Condition	Action	Comments
BR 113	If the provider is a "specific," (e.g., pediatric) practice, the currently administered vaccinations should match a pattern in similar practices. Note: This could apply to many practices. A practice includes a unique combination of various groups of the population. Data Items: • Vaccine Type • Date of Birth • Vaccination Encounter Date	• Accept and flag for investigation (initiate research of provider's records)	• See section " Precertification and Providers' Profiles" and Appendices E and F for specific distributions for various practices and for possible approaches to utilize providers' profiles. • Research may include: ➢Dialog with provider to determine if the reported percentages reflect actual clinical activity (e.g., inventory shortage or manual coding errors). ➢Audit automated data processes for systematic omission of data or faulty code translation. • Principle(s): P01, P05, P06.
BR 114	Vaccination Encounter Date should not be on the Patient Date of Birth unless it is on the list of vaccines recommended on the date of birth, e.g. HepB. Data items: • Vaccination Encounter Date • Patient Date of Birth •Vaccine Type (or CVX, …)	• Batch: Accept and flag for investigation • UI: Accept (after issuing a warning)	• Possible interpretations: Clinical error Professional decision which differs from common practice The current date accidentally typed in the Encounter Date field (instead of a date few days ago when vaccination was given) Other typographical error • Research may include: Provider reviewing patient chart Provider contacting patient or other source to validate Date of Birth • Principle(s): P01, P02, P04, P05, P10. • Other: Closely related to BR101

Results Overview

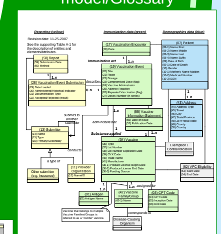
	Patient Immunization Status	Vaccination Level Deduplication	Incoming Data Quality Assurance
Timeframe	2005	2006	2007
Face-to-face meeting	Aug 16-18, 2005 Atlanta, GA	May 8–10, 2006 Washington, DC	Aug 21–23, 2007 Atlanta, GA
Experts' panel size	16	20	11
Products Highlights	6 statuses defined on the Provider level, 5 – on Geographic Jurisdiction level	9 Principles, 20 Business rules, 23 Illustrative scenarios	13 Principles, 32 Business rules on cross-check validations

Community feedback

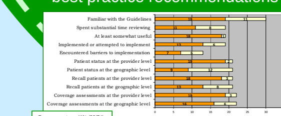
Principles

Nbr	Statement	Comments
P01	Consistency principle: The conditions (criteria) for validating data items should be the same regardless of how these data items have been reported to an IIS.	Regardless of a data item's source and the way the data have been reported (e.g., direct user entry versus batch reporting), the data item should go through the same set of data validation checks (conditions/criteria). Note: Business Rules encompass both conditions (criteria) and actions to be taken (see Chapter 5). Related Business Rules: all.
P02	Variable outcomes principle: When conditions (criteria) of a validation check are not satisfied, the resulting actions (e.g., accept, reject, research) may vary depending on the data item's source and the way data were reported.	For example, interactive exchange/method (user interface - UI) versus non–interactive exchange/method (batch reporting): If users fails to complete a non-mandatory field, they may be asked if they intended leave the field blank, though in a non-interactive mode, the fact that the field is missing might be ignored and no action taken. Note: Business Rules encompass both conditions (criteria) and actions (see Chapter 5). Related Business Rules: BR101, BR102, BR114, BR118, BR119, BR120, BR122, BR126, BR128. Definition of "UI" (user interface) method of submission: interactive session when a Submitter conducts a direct data entry in the IIS. Definition of "Batch" method of submission: automated non-interactive transmission of data to the IIS; could include data on multiple vaccination events or on a single vaccination event.

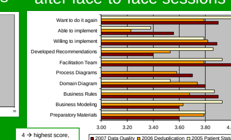
Domain model/Glossary

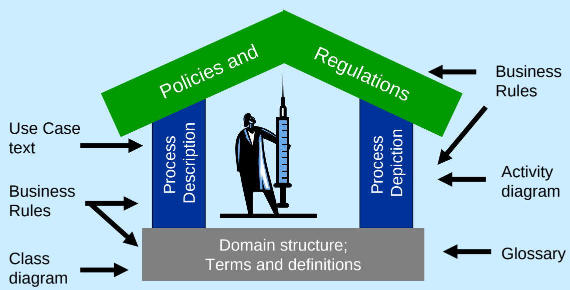


Evaluation results for best practice recommendations


Familiar with the Guidelines
Spent substantial time reviewing
At least somewhat useful
Implemented or attempted to implement
Encountered barriers to implementation
Patient status at the provider level
Patient status at the geographic level
Recall patients at the provider level
Recall patients at the geographic level
Coverage assessments at the provider level
Coverage assessments at the geographic level
Response rate = 41% (30/74)

Experts feedback after face-to-face sessions


Want to do it again
Able to implement
Willing to implement
Developed Recommendations
Facilitation Team
Process Diagrams
Domain Diagram
Business Rules
Business Modeling
Preparatory Materials
3.00
3.20
3.40
3.60
3.80
4.00
4 → highest score,
1 → lowest score
2007 Data Quality
2006 Deduplication
2005 Patient Status



Department of Health and Human Services
Centers for Disease Control and Prevention
American Immunization Registry Association
Northrop Grumman

Conclusions

- The C-cube approach provides a framework and guidance for analysis, documentation, and improvement of public health operations and processes. It offers specific guidelines for coherently organized facilitated collaborations among experts that lead to a formulation of best practice recommendations for selected public health topics. These best practice recommendations are documented in a form of business models. The C-cube approach covers all aspects of process analysis and improvement efforts, including such crucial organizational details as selection of a topic for the examination, assembling of a multidisciplinary team, step-by-step activities performed along the way, and business modeling and facilitation techniques to be applied.
- Results of the special survey conducted in 2007 among US state IIS indicate that recommendations and associated business models developed with utilization of the C-cube approach are beneficial for IIS. Implementation of the C-cube approach leads to the alignment of operations among public health programs. That positively affects consistency and quality of public health data.
- Developed business models, besides capturing best practices recommendations,can be used to drive information technology requirements, as well as for educational and training purposes. The C-cube approach helps to develop consensus-based solutions through the collaboration among public health stakeholders for a variety of purposes: best practice recommendations, business and IT systems requirements, policies, operational procedures,communications with partners, data acquisition protocols, and business rules. It can be applied across the public health domain, as well as in other settings.

Acknowledgements

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