MAINE HEALTH DATA ORGANIZATION
(MHDO)

ASSESSMENT AND RECOMMENDATIONS

Version: Final

STATE OF MAINE
MAINE HEALTH DATA ORGANIZATION
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Dear Data Partner,

Maine is one of the few states to have developed an all payer claims database. Health reform and a myriad of public/private initiatives focused on containing health costs and improving quality have increased demand for this data. We believe this is a sign of things to come and take seriously our responsibility in assuring that the data is accurate and available in a timely manner.

Over the last year, MHDO's board of directors has heard from individuals and organizations concerned about the timeliness and availability of claims data. In response, we engaged Deloitte, a private consulting firm, to assess MHDO's current claims data processing and recommend improvements. The report that follows contains Deloitte's findings and recommendations.

This report provides a foundation for MHDO's future work by recommending improvements that will position the organization to:

- Deliver on existing timelines, specifically providing commercial and MaineCare claims data within 90 days of the close of each quarter. Medicare data currently has a fixed two year time lag.

- Operate with greater transparency and accountability making it easier for board, staff and partners to address problems and manage change more effectively.

- Improve stakeholder communication and customer satisfaction.

MHDO's staff will implement key recommendations from the report and work with the Maine Health Data Processing Center and the Office of Information Technology to resolve existing backlogs. We appreciate your patience as we work through these issues and assure you that MHDO's board will remain involved throughout this process.

Please contact MHDO's Executive Director Al Prysunka or me if you have concerns or questions about MHDO or the availability and use of claims data. We look forward to working with you in the future to meet your health data needs.

Sincerely,

Catherine A. McGuire

MHDO Board Chair

REVISION HISTORY

Version	Date	Author	Action/Summary of Changes	Status
1.0	10/15/2010	Gopal Wunnava / Bharat Chaturvedi	Initial Draft	Complete
2.0	10/22/2010	Bharat Chaturvedi	Final Draft	Complete
3.0	11/3/2010	Brian Erdahl	Apply MHDO Steering feedback	Complete
4.0	11/19/2010	Bharat Chaturvedi	Apply MHDO Steering Committee feedback	Complete
5.0	11/22/10	Bharat Chaturvedi		Complete
6.0	11/24/10	Bharat Chaturvedi	Final Version	Complete

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1   EXECUTIVE SUMMARY

MHDO requested an independent review and subsequent recommendations on the MHDO organization, processes and technology required to address the current issues with the quality and timeliness of the data being provided to the customers. The focus of the review was on the short term challenges being faced and develop some subsequent steps to improve the stability and consistency of data delivery within the current structure of MHDO.   The resulting recommendations focus on some key steps that are required to deliver data after 90 days of the close of quarter for commercial and MaineCare claims on consistent basis. These recommendations will serve as the baseline for MHDO to achieve this stability and consistency while also positioning MHDO to further enhance their data delivery capabilities in the future.

The remainder of this section describes the activities that were performed for this assessment, initial findings and high level recommendations developed for Maine Health Data Organization (MHDO), Onpoint Health Data (Onpoint) and Office of Information Technology (OIT) teams.

1.1   Activities

The assessment was structured and performed in three (3) phases

1. Current state assessment – *Where are we?*
2. High level gap analysis – *Identification of barriers to timely receipt of claims data and making it available to stakeholders*
3. Recommendations – *How do we make accurate claims data available to stakeholders in timely fashion?*

Where are we?	Identification of barriers	How do we get there?
Step 1 Analyze and Assess	**Step 2 Gap Analysis**	**Step 3 Recommendations**

Goal of this phase was to perform a current state assessment of process, technology and people.

Activities
1. Review and analyze current documentation
2. Obtain and review documentation describing as-is technology and business processes
3. Conduct management / employee interviews (MHDO, Onpoint, OIT and stakeholders)
4. Document high level roles and responsibilities
5. Review data exchange agreements between payers and Onpoint
6. Review data exchange agreement between Onpoint and MHDO
7. High level current state architecture and data exchange flow

Deliverable
Current state assessment

Goal of this phase is to understand future state business needs and assess gaps

Activities
1. Evaluate and assess the gaps between current state and future state
2. Document key issues and barriers
3. Define prioritization criteria

Goal of this phase is to develop the recommendations

Activities
1. Develop recommendations
2. Prioritize the recommendations

Deliverable
Recommendation document

1.2 Initial Findings

As mentioned in the Activities section, the first step of overall assessment is to perform the as-is analysis of MHDO. To perform the as-is analysis we met with MHDO, Onpoint and OIT teams and the external stakeholders of MHDO to understand the current state. In addition, we also extrapolated the overall organization's current state capabilities to a typical Data Warehouse organization and some of the best practices used in organizations similar to MHDO. This helped us in identifying the gaps and barriers to expected performance. The table below briefly describes these findings.

Initial Findings	
Process	• Onpoint is the data processing entity for all claims data. • There are different data flow processes for Commercial, Medicare and MaineCare data, due to the different formats in which data is submitted resulting in added processing time for these claims. In addition the Medicare claims submissions are currently way behind the commercial and MaineCare claims collection schedule. • An interface agreement which defines the details of data to be sent from Onpoint to MHDO does not exist. This has resulted in mismatched expectations and increased processing time. • The project management discipline exists with limited maturity resulting in unpredictable outcomes, varying expectations and lack of communication. • The Data Governance structure currently does not exist resulting in non-standard processes, in-efficient processing.
Data	• Payers have raised concerns about inconsistencies in applying the rules for data collection and acceptance. • The data is not delivered to stakeholders as per the communicated timelines. • Some stakeholders want the claims data to be available sooner than the goal of 90 days after the close of quarter. As per the current processes, if the data is made available sooner than 90 days it will be an incomplete dataset – based on the analysis performed, only 50% of the claims are adjudicated within 1 month of service provided and another 35% in 2nd month. This is the limitation of claims data currently available to MHDO and if stakeholders are to use this data for analysis, they will need to allow for this limitation.
Technology	• The current MHDO architecture is a flat table driven structure, resulting in increased time to access the data. • The automated quality checks are not performed by MHDO on the data received from Onpoint, which sometimes has resulted in iterative processing which has resulted in delays in providing the data to customers.
People	• There is no one person with the adequate time to lead the MHDO/OIT team on detailed operations and project activities from day-to-day perspective. • The role definitions and associated responsibilities of Quality Assurance (QA) Analyst(s), Business Analyst(s) and Data Base Administrator (DBA) do not exist within the team. These are key roles for an organization like MHDO.

These findings are described in significant details in the section 7.

1.3 Recommendations

As mentioned earlier, while assessing the capabilities of MHDO we compared there capabilities to similar organizations. In addition we also used industry best practices as guidelines to define a path forward. One of these industry practices is called the Capability Maturity Model (CMM) – it measures an organization's processes and ranks them according to defined levels of maturity. We did not perform an

official assessment of CMM maturity for MHDO, however we did use the generic principles defined in this model. This comparison can be summarized as follows: most of the processes in MHDO are ad hoc and people dependent, which is the lowest level of maturity. Based upon the focus of the assessment to define recommendations to gain stability and consistency, we recommend a number of people and process steps that are the baseline upon which MHDO needs to establish for this consistency and any future enhancements. Additionally a number of technical enhancements have been identified that can additionally improve consistency and stability, but will take more resources to implement.

Recommendations	
Process	• Establish a leadership structure that facilitate collaboration among MHDO, Onpoint and OIT • Establish an interface agreement between MHDO and Onpoint • Implement project management processes • Establish Data Governance structure to facilitate adoption of standards to provide better control and consistency in how data models are developed
Technology	• Implement dimensional data warehouse architecture • Implement a enterprise service bus architecture
People	• Establish a new position to fill the role of Project Manager • Assign role of Quality Assurance (QA) Analyst(s) within existing team • Assign role of Business Analyst(s) within existing team • Assign a role of Data Base Administrator (DBA)

In the table above, we have grouped the recommendations into process, technology and people categories. The first step for MHDO should be to implement Process and People recommendations. This will result in better defined processes and predictable outcomes – for stakeholders it would mean consistently meeting the expectations as they are set today (90 days turnaround after the close of quarter for commercial and MaineCare claims). These steps will move MHDO towards the next level of maturity which will allow you to take the next step of implementing the Technology recommendations.

These Technology recommendations will allow MHDO to attain greater efficiencies in turnaround targets, increased reporting capabilities and increased data sources/subjects that are interrelated to the existing dataset. In addition implementation of these recommendations will increase the efficiency of the MHDO team by reducing the processing time, providing increased data integration and ease of access to the data.

These recommendations are described in detail in section 8.

2   SCOPE

Deloitte was engaged by Maine Health Data Organization (MHDO) to conduct an assessment of its business processes and system that supports collection and reporting of health data. The focus of the assessment was to provide recommendations for improving the capability to make healthcare information accessible to the public in a timely fashion. Due to the complexity, breadth and demand for claims data, this was the focus area of our analysis. The scope included an as-is assessment of current processes and associated technology used for the claims data collection from payers and subsequently making available to stakeholders. Subsequently the team performed a gap analysis as compared to where the process and technology should be, and development of recommendations along with their sequencing and prioritization.

The scope of this effort did not include an assessment of hospital, financial and quality data and their associated processes and technology. In addition, it also does not include creation of a detailed list of activities, staffing plan and overall cost to implement the recommendations developed to improve healthcare information delivery and its reporting. The cost of implementing the recommendations proposed in this report will be developed and analyzed by MHDO board.

3   OUR APPROACH

Our comprehensive approach is built on the foundation of our The Enterprise Information Management™ (EIM) methodology and refined through multiple engagements in public sector and healthcare organizations. This methodology provides a structured approach throughout the lifecycle of EIM projects including the assessments. We customized this methodology to meet the needs of MHDO and used the following framework.
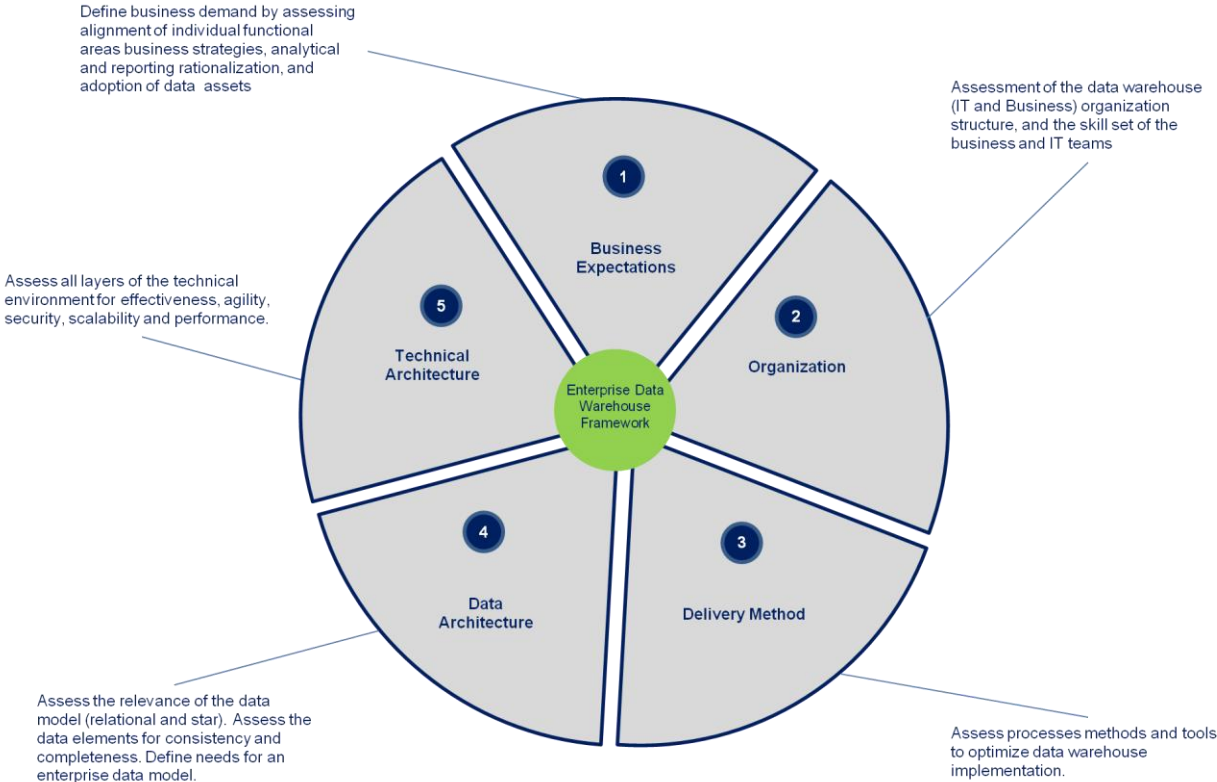

Figure 1 – Our Enterprise Information Management approach

This framework is primarily divided into two components

1. Business Focus Area
2. Technical Focus Area

Business Focus Area – This component focuses on value drivers for the MHDO, the expectations of stakeholders (both from data quality and its delivery perspective), current pain points and opportunities

for improvement. In addition it also focuses on MHDO organization structure, Business Intelligence (BI) and maturity of its stakeholders in usage of data and BI.

Technical Focus Area – This component focuses on technical architecture (infrastructure, business access layer, data integration & aggregation), data architecture (data model, data architecture, metadata, data stores etc) and delivery of this information to end-users. In addition this focuses on Software Development Life Cycle (SDLC) and other technical management processes.

Using this framework we structured the activities to perform the current state assessment, gap analysis and develop recommendations. We divided the overall assessment to process, technology and people area, which is in line with the framework. We met with the MHDO Executive Director, Onpoint team and leadership, Associate Chief Information Officer (CIO) of Office of Information Technology (OIT) and MHDO / OIT teams to understand the current state and pain points of processes and systems. We also met with business stakeholders that included representative from payer group, provider group and government group and we received written feedback from member group. After understanding the current state we compared these to industry best practices in process, technology and people area and then developed the recommendations along with a proposed roadmap.

4   ALL PAYER CLAIMS DATABASE (APCD) OVERVIEW

States are facing increasing health care challenges, from variable quality of care to ever-increasing costs. Comprehensive information on disease incidence, treatment costs, and health outcomes is essential for informing and evaluating state health policies, but it is not readily available. To address these information needs, some states are developing APCDs, and these systems are proving to be valuable information sources. As more states implement APCDs, efforts will be made to standardize common data elements that will improve the comparability of data from state to state. The National Association of Health Data Organizations (NAHDO) and the All Payer Claims Database Council (APCDC) are coordinating a multistate effort to support state APCD initiatives and shape state reporting systems to be capable of supporting a broad range of information needs.

All-payer claims databases are emerging to support health care transparency and reform initiatives in states. The definition of an APCD, as developed by NAHDO and APCDC is as follows: *databases, created by state mandate, that typically include data derived from medical claims, pharmacy claims, eligibility files, provider files, and dental claims from private and public payers. In states without a legislative mandate, there may be voluntary reporting of these data.*

As health care reform initiatives are enacted across the country, states have an unprecedented opportunity to make lasting, effective policy decisions. The lack of comparable, transparent information is an obstacle all health care stakeholders have historically faced in making policy and market decisions. Transparent data not only contribute to making effective policy decisions, they also give consumers the tools to make informed decisions about their own health care; consumers' need for these data, particularly on costs and quality, will only increase as consumers begin to take a more active role in their health care decisions. The broad availability of health care data has been demonstrated to improve quality, and states that have access to comprehensive information are in a position to enact better policies now and to track these policies' impact and effectiveness over time.

Policymakers, consumers, purchasers, providers, and other health care stakeholders are currently using APCDs in Kansas, Maine, Maryland, Massachusetts, Minnesota, New Hampshire, Utah, and Vermont, and these databases will soon be available in Colorado, Oregon, and Tennessee. And voluntary (that is, not state-run or state-mandated) initiatives have been established in Wisconsin, and Washington State to aggregate claims data with the primary objective of improving market and purchasing decisions.

At the state and national levels, APCDs bring information on cost, quality, and administration to a wide variety of health care constituents: consumers, policymakers, researchers, employers, public health departments, commercial payers, providers, and others.

Examples of the vast and varied information APCDs can provide include:
- Hospitals having the highest prices

- Percentage of an employer's workers that have had a mammogram

- How far people travel for types of services

- Whether established clinical quality and safety guidelines are being met

- Underlying drivers for emergency room usage in Medicaid if higher than commercial population

- Demographic and timeframe data on patients are using antidepressant medications

- Utilization patterns of Medicaid in comparison with the commercially insured population

- Gaps that can be identified in disease prevention and health promotion services

- State locations which provide better access to specialists

States typically start populating their APCDs with data from commercial carriers and third-party administrators licensed in the state and, if available, Medicaid claims data. Four states (Maine, Maryland, Massachusetts and Minnesota) have acquired Medicare claims data from the Centers for Medicare and Medicaid Services (CMS) for beneficiaries in their respective states and most of the other states plan to request similar data from CMS. No state has incorporated TRICARE and Federal Employees Health Benefits Program (FEHBP) data in its APCD, and data on the uninsured is generally not available; the state of Maine does have data from a portion of its uninsured population. Once APCD reporting is established for commercial plans, a state can establish priorities for filling data gaps. The table below denotes each state's current sources of claims data

States	Medicaid Data	Medicare Data	Commercial Data	Uninsured Data
Kansas	Yes	No	Yes	No
Maine	Yes	Yes	Yes	Yes[*]
Maryland	No	Yes	Yes	No
Massachusetts	No	Yes	Yes	No
Minnesota	Yes	Yes	Yes	No
New Hampshire	Yes	No	Yes	No
Utah	Yes	No	Yes	No
Vermont	No	No	Yes	No

* As of now only partial data is available for uninsured population. Maine is the only state to collect data from a portion of its uninsured population. Maine Health, the largest health system in the state, provides identification cards to uninsured individuals using their services to better manage their care and to document uncompensated care. Maine Health then submits pseudo-claims to a third-party administrator (TPA) owned by a national insurer for processing as if they were from insured patients, but no payment is made. Summary information on the uninsured patients is produced by the TPA for Maine Health and claims data files are submitted to the state data agency. From a policy perspective, capturing data on the uninsured is important and this has the potential to be a model for the rest of the states.

The most sensitive aspect of APCD implementation is determining what data and information will be released and to whom. The variation in policies and practices across states reflects the potentially contentious nature of determining who may access the information and the processes controlling release.

In some states, like Maine and New Hampshire, aggregated payment data are published on a public Web site and de-identified and research files are made available for qualified users and uses. Of the states with existing APCDs, Minnesota has the most restrictive data release policies, limiting data access to state government only. The policy of Maine is to make this data available to stakeholders as widely as possible to improve the health Maine people.

5 MHDO OVERVIEW

5.1 OVERVIEW

The Maine Health Data Organization (MHDO) is an independent executive agency that collects clinical and financial health information for the state of Maine and makes health data information publicly available while protecting patient confidentiality and respecting providers of care.

MHDO was established as an independent executive agency in 1996 by the 117th Maine Legislature to maintain and expand the health information databases of its predecessor, the Maine Health Care Finance Commission (MHCFC). The Legislature provided the Organization with a mandate to create and maintain a uniform objective, accurate and comprehensive health care information data bases and to develop and implement data collection policies and procedures for the collection, processing, storage, and analysis of clinical, financial and restructuring data.

5.2 WEALTH OF DATA

MHDO collects claims data, hospital data including inpatient, outpatient, emergency room and financial data, quality data and has been collecting these data sets for a number of years for the state of Maine. MHDO has a wealth of data at its disposal and its information assets provide considerable value and benefits to the citizens of Maine.

5.2.1 CLAIMS DATA

MHDO created the nation's first APCD and has been collecting claims data since 2003. MHDO collects medical, dental and pharmacy claims data from commercial carriers, TPAs, Pharmacy Benefit Manager (PBM) and Medicare and Medicaid claims data from government agencies. The data submission schedule for payers is determined by the number of Maine members covered in at least one month of the calendar year.

1. All the payers that have more than 2000 members – Monthly submission
2. All the payers that have 501-2000 member – Quarterly submission
3. All the payers that have 50-500 member – Annual submission
4. All the payers that have less than 50 members - Exempted

Maine has more payers submitting the claims data than any other state (99 payers currently submit the data).All claims data collected by MHDO is processed by Maine Health Data Processing Center (MHDPC), a unique public private partnership with Onpoint created by legislation.

5.2.2 HOSPITAL INPATIENT DATA

Maine was one of the first states to develop a database of hospital inpatient records which cover 100 percent of all patients discharged from its acute care and psychiatric hospitals. In 1978 the Maine Health Information Center (a private non-profit entity) in cooperation with Maine hospitals established a voluntary inpatient database. In 1983 legislation was enacted that mandated the Maine hospitals to submit inpatient (discharge) data to the MHCFC in a state specific format, which was converted to a standardized UB-92 format in 1999. The MHDO currently has in its possession over three million hospital discharge records from the years 1980 to the present (three years of data were acquired from the Maine Health Information Center database) that are available for research use. The continuous collection over an extended period of time makes Maine's hospital inpatient database one of the most useful in the country for the study of long-term trends in disease and utilization patterns.

5.2.3   HOSPITAL OUTPATIENT DATA

Maine is the only state to have a complete hospital outpatient database (records are generated for every visit and all services provided). In 1992 the MHCFC started collecting outpatient data in a state specific format. Then, in 1994 MHCFC received a $522,976 two year demonstration grant from the Health Care Finance Administration to expedite the development of the database and implement and evaluate Ambulatory Patient Groups as an outpatient measurement and financing methodology in Maine. In order to improve data quality and standardize data submissions, MHCFC modified the outpatient submission format to the UB92 format in 1995. During 1995 to late 1997, the database was modified a number of times and the Maine hospitals were struggling with system issues that resulted in poor data quality. Consequently, the first outpatient data sets available for public release by the MHDO are those for calendar year 1998. Beginning with 1998, over two million outpatient visit records and eight million detailed records have been collected each year.

5.2.4   EMERGENCY ROOM DATA

Due to the increasing interest from researchers and policy makers in services provided at hospital emergency departments for the growing uninsured and underinsured patient population, the MHDO established an emergency department database in year 2002. The database is a subset of the inpatient and outpatient databases and is available beginning with 1999 data.

5.2.5   HOSPITAL FINANCIAL DATA

A hospital financial database was established by MHCFC in 1987, with data available for distribution from 1990. These data, which include assets, liabilities, depreciation, fund balances, net patient service revenue, charity care, operational expenses, and net margins, are drawn from audited financial statements and Medicare Cost Reports that have been continuously collected by the MHDO in standardized templates, which were created to normalize the data from audited financial statements. Financial data is collected as per rules defined in chapter 300 Code of Maine Rules (CMR) 90-950.

5.2.6   NON-HOSPITAL PROVIDER DATA

In an effort to better understand the migration of certain procedures from the hospital setting, the MHCFC began in 1990 to collect unit record data for selected ambulatory procedures undertaken by ambulatory surgical centers, freestanding radiological facilities, and physician offices. From 1990, data have been collected for approximately 150 categories of ambulatory surgeries and major diagnostic services. The number of records received by the MHDO grew from under 25,000 in 1990 to over 100,000 in 1993. The number of non-hospital providers submitting data also grew from under 20 in 1990 to over 100 in 1993. Due to the difficulty with collecting data on paper claims from so many providers and with the creation of the APCD, the collection of data directly from non-hospital providers was discontinued in year 2004.

5.2.7   QUALITY DATA

MHDO collects quality data from hospitals. The quality data is collected as per the rules defined in chapter 270 of CMR 90-950. The data is submitted to MHDO no later than the end of the 5th month following end of each quarter (for example, the 1st quarter of calendar year data is required by 1st September). The data is submitted for all patients identified as eligible cases for Acute Myocardial Infarction (AMI), Pneumonia, Heart Failure, selected surgeries identified in CMS manual for National Hospital Quality Measures, Infection quality measures. The data is also submitted for nursing-sensitive patient-centered healthcare quality. This includes metrics like percentage of patients who have hospital-acquired pressure ulcer, number of inpatients falls per inpatient days etc. The data is also submitted for 3-Item Care Transition Measure (CTM), culture of patient safety.

5.3   LEADERSHIP ACCOMPLISHMENTS

MHDO has several notable accomplishments to its credit. MHDO is the nation's first statewide All Payer All Claims Data (APCD) repository. NAHDO (National Association of Health Data Organizations)

bestowed an 'Award of Excellence' in October 2007 for successful implementation of the nation's first statewide all payer all claims reporting system and for serving as a model for other state systems. In addition Al Prysunka, Executive Director of MHDO, is currently chair of NAHDO. Other states including New Hampshire, Tennessee, Vermont and Minnesota have incorporated Maine's model of a statewide all payer all provider claims data repository.

Maine is one of the first states to develop a database of hospital inpatient records which cover 100 percent of all patients discharged from its acute care and psychiatric hospitals. The collection of hospital inpatient data since 1980 makes Maine's hospital inpatient database one of the most useful in the country for the study of long-term trends in disease and utilization patterns.

Maine is the only state to have a complete hospital outpatient database and has been collecting data for every visit and all services provided since 1992.

6   ROLE OF MHDPC/ONPOINT

MHDPC/Onpoint is a unique public-private partnership whose primary purpose is to collect and process health care claims data from data submitters that include payers, providers, TPA's, state and federal agencies. From an MHDO standpoint, Onpoint manages the collection and processing of claims data from data submitters and provides the data to MHDO on behalf of MHDPC. All references to Onpoint in the ensuing discussion should be inferred to include both MHDPC and Onpoint from an MHDO standpoint.

6.1   HISTORY OF MHDPC/ONPOINT

In 2001, the Maine Legislature enacted a unique piece of legislation that established the Maine Health Data Processing Center (MHDPC), a true public/private non-profit entity, in association with Onpoint – formerly known as the Maine Health Information Center (MHIC), a health data organization that has been around for thirty five years. The Center is financially supported by both the MHDO (60%) and the Onpoint (40%). Its activities are overseen by an eleven member board, composed of: the Director of the MHDO; the President of the Onpoint; three members representing different constituencies from the MHDO Board; three members from Onpoint Board; and three chosen from healthcare providers, third party payers, employees and consumers of healthcare. The purpose of the Center is to build (which was initiated in the fall of 2002) and maintain an all payer/all provider health care claims database and to provide it to the MHDO for distribution. The database is comprised of four principal claims data files (member, medical, pharmacy, and dental) and provider file. It is the only one of its kind in the country.

6.2   ONPOINT OVERVIEW

Onpoint collects claims data, hospital discharge data sets and workers compensation data sets. Collection of claims data at Onpoint started in the mid 90's under a contract with Maine Health Management Coalition and Maine was the first state involved in the exercise. Onpoint collects claims data from payers and government agencies and currently about 400 health plans across the country are supported. Onpoint is a non-profit organization as revenues are poured back into the system.

In 2002, Onpoint built a new platform for Maine to support its all payer all claims model (APCD).

6.3   DATA SUBMITTOR PROCEDURES

Onpoint receives claims data from submitters in the form of third party payers, third party administrators, Medicare health plan sponsors and pharmacy benefit managers. The procedures for data submission are discussed below.

6.3.1   RULES FOR CLAIMS DATA COLLECTION – CHAPTER 243

Data rules for collection of claims data are defined by MHDO in chapter 243 of Code of Maine Rule (CMR) 90-950.

Chapter 243 contains the provisions for filing health care claims data sets from all third-party payers, third-party administrators, Medicare health plan sponsors and pharmacy benefits managers.

The provisions include:

- Identification of the organizations required to report
- Establishment of requirements for the content, form, medium, and time for filing health care claims data

- Establishment of standards for the data reported
- Compliance provisions

Every claim data set has a header and trailer record. These records contain metadata identification information such as the name of the payer submitting claims, type of claims data (dental claims, medical claims, pharmacy claims), eligibility data, record count and the beginning and ending periods that apply for the claims data contained in the data file.

Each data element in the claims specification is identified by an alphanumeric code such as ME001','ME002' and so on. This is followed by a business description of the data element (such as 'Payer', 'National Plan ID'), the date required, the data type(integer or text) and the code/domain values ('MA' to indicate Medicare Part A,'MB' to indicate Medicare Part B).There are approximately 225 data elements in all that are listed in the specification.

6.3.2 PROCEDURES WITH DATA SUBMITTERS

MHDO does the research to determine new data submitters and licenses. A list of new submitters is provided annually by MHDO to Onpoint.

For every new data submitter, Onpoint establishes the data elements as defined in Chapter 243 of CMR 90-950, described above. This is followed by definition of file formats and establishment of user id/access privileges to the Onpoint web site (Web Uploader tool) for uploading data files in a secure environment. Onpoint works with submitters on activities such as deciding frequency of data submission, registration, training and provision of encryption software etc. Thresholds for each data element, as defined by MHDO and the state, are made known to the submitter. Submitters provide a month's worth of data for initial testing. The data first goes through the load process. Data passes through more than 300 edits; each edit has a default threshold setting. The Onpoint team reviews data with the help of the data edit team and validates against the thresholds defined by MHDO. Subsequent processes involve further data quality edits and checks around eligibility of claims. After the initial month's worth of data has been processed, six months worth of data is requested from the submitters.

The Onpoint team reviews Per Member per Month (PMPM) trends in the data provided by the submitters. Representatives from the data submitters are brought on board and the PMPM results and trends are reviewed with them. Historical data beyond six months is requested as the next step. Once data has been tested and validated, the submission process begins on the schedule determine by the numbers of members in Maine.

6.3.3 CLAIMS DATA MANAGER (CDM) OVERVIEW

CDM is Onpoint solution for collecting claims data. All data elements defined in Maine's data collection rules currently are collected through the CDM solution. CDM contains element completeness rates and data quality rates for every submission.

6.3.4 COMPUTING ENVIRONMENT

Oracle 10g Enterprise Edition is the SQL relational database structure for the data warehouse and for all intensive data processing activity. The database structure resides on a partitioned and clustered Enterprise Edition of Oracle 10g in a data warehouse attached by redundant fiber-channel switching to a Redundant Array of Independent Disks (RAID) configured scalable Storage Area Network (SAN). Onpoint also maintains an Oracle 10g Standard Edition of summarized data in the external DMZ for the many applications that require report data available through web interfacing. This instance of Oracle also is integrated with the SAN.

All web application servers are located in firewalled DMZ environments, with external access limited to only necessary network ports: HTTP, HTTPS, domain, and secure shell. Onpoint uses the current releases of Red Hat Enterprise Linux, Apache web server software, and Secure Socket Layer (SSL) certificates

through VeriSign. Jakarta Tomcat Java application servers provide a container for server-side Java applications. Oracle's MySQL is used for the relational database services supporting web applications.

6.3.5 SECURE RELEASE AND AUDIT

Onpoint has procedures and policies in place that provide for the protection and secure receipt/release of information. In addition, Onpoint provides the following functionality and compliance:

- Procedures that control access to secure information
- Security awareness and training for staff
- Logging and monitoring of access to data
- Procedures to respond to suspected or known security incidents

6.3.6 ENCRYPTION AND SECURITY METHODS

Onpoint encryption software is platform agnostic and performs field-level encryption at the browser on the data submitter's desktop. For Maine, encryption occurs at the data element level. Names, Social Security numbers, contract information, and any other protected health information (PHI) collected as parts of a statutory rule are encrypted. The state's data submission rules govern rules around which data elements need to be encrypted.

In addition to encrypting PHI, the Onpoint encryption application performs preliminary verification of statutory file formatting, verifies some header and trailer data elements, and produces a zipped text file ready for submission through a secure online upload (or through the mailing of a CD, DVD, or external drive). This upload process uses an encrypted tunnel to transmit the file to the Onpoint CDM portal.

6.4 DATA FLOW

Data is evaluated as it flows through the various CDM modules. An overview of the data flow process and data edit procedures is provided below.

6.4.1 PRELIM

The external component of CDM assigns a permanent, unique file ID that is used to track submission stage and status as well as basic information regarding when it was submitted, the type of data, the submitter, the volume of records, and the time span covered. During this PRELIM phase, the submission is unzipped and standard file-level checking is performed. This process includes validating date ranges, validating the submitter code, comparing the actual record count against the header record, and comparing the records against the file type indicated in the header. PRELIM fails the submission at the first occurrence of any PRELIM error and automatically emails the submitter that failure has occurred, noting the reason for the failure, the record containing the failure, and a request for resubmission. Any file that has not been run through the encryption tool prior to submission will be failed by PRELIM.

6.4.2 LOAD

The internal system has three major phases: LOAD, TRANSFORMS, and EDITS. In the LOAD phase, the text file is loaded into Oracle and a text-based Oracle view of the file is created. This step is necessary to accommodate data that fail to load due to incompatibility with the data type (e.g., alpha data in a numeric field). LOAD verifies the existence of critical data elements at a high level. For example, a medical claims submission in which more than 10 percent of the records have a blank primary diagnosis code is a LOAD/FAIL condition. These high-level thresholds are programmable at the submitter level. All LOAD thresholds are evaluated. If a submission fails one or more LOAD conditions, Onpoint CDM

automatically emails the submitter a list of failures and requires a resubmission. Currently there are 9 eligibility, 20 medical/dental and 15 pharmacy LOAD conditions.

6.4.3   TRANSFORMS

TRANSFORMS populates value-added fields used in data-element validation and data warehouse tables. The TRANSFORMS phase includes the setting of age, standardized product, and relationship coding across data types and drug categorization. Any standardization of submitted data occurs in a new field, preserving all of the data as originally submitted by the reporter unless the submitter or state agency authorizes changing the submitted data.

6.4.4   FREQUENCY REPORTS

A frequency report is created for every data element to evaluate the percent of records with (a) a null entry, (b) a valid entry, and (c) an invalid entry. The completeness percent, based upon records with a valid entry, is evaluated against the MHDO-approved tolerance threshold for that data element. Any submission with one or more data elements that fail the threshold test will be rejected. An email to the submitter containing a brief message indicating submission failure and a link to the online report for the entire submission will be generated and sent automatically by Onpoint CDM. The statewide threshold is parameter driven and can be adjusted as directed by MHDO.

6.4.5   EDITS

The EDITS phase focuses on data quality and includes data verification checks that evaluate both the validity and distribution of individual data elements and crosscheck the appropriateness of values in conjunction with other data contained in the same record. There are approximately 35 eligibility verification checks, 85 medical verification checks, and 45 pharmacy verification checks. The edits include crosschecking data against national coding systems, including but not limited to ICD-9 diagnoses, ICD-9 procedures, CPT and HCPCS procedures, and NDC codes. EDITS also performs data quality checks to assess the interrelationship of individual data elements and evaluates rates against parameter-driven thresholds. If a submission passes all data-quality threshold checks, it is marked as DQ/PASS and an email automatically is sent to the submitter indicating successful submission. If a submission fails one or more data quality thresholds, it is marked as DQ/REVIEW and the submitter is notified that their data quality report has been flagged for manual review.

6.4.6   QUALITY CHECKS

Once submission has passed all threshold levels, data quality checks are used to assess submitted content. These checks, defined for each type of data, frequently include comparing the contents of one field against another. Submissions failing to meet one or more of the quality checks are reviewed manually. If it is found that one or more of the quality checks yielded suspect results, a detailed email will be sent to the data reporter regarding the nature of the situation. The data reporter will be asked to correct the problem. A detailed copy of the data quality report is available online for review by authorized individuals.

While quality checks are used to verify that accurate data are being submitted, there are no automatic thresholds for passing quality checks as there are with the load thresholds. Quality checks can be influenced by the membership and benefit structure of a given data submitter. A submission must have a status of DQ/PASS to be accepted.

DQ/REVIEW submissions are reviewed manually within three business days. Hands-on data mining generally is required for problems identified in these submissions.

6.4.7   APPROVAL REPORTS

Once a submitter has successfully passed files through DQ/REVIEW, Onpoint staff runs the data through an approval process that compares eligibility data to claims data, looking for how well they support each other. Onpoint takes an initial look at the statistics regarding per member per month (PMPM) measures and the proportion of members receiving services.

7   OUR UNDERSTANDING

As described in our methodology, the current state assessment is divided into three components

1. Process,
2. Technology
3. People

This division allows us to get a deep understanding of the business of MHDO, while simultaneously giving us perspective of the pain points of MHDO and Onpoint teams, multiple business stakeholders and the leadership of organization.

7.1   PROCESS OVERVIEW

This section provides a discussion on current processes at MHDO, as they are practiced today. This includes business processes, project management processes and technical management processes.

7.1.1   OVERVIEW

MHDO's data collection process spans across claims, hospital, quality and financial data, however this discussion is focused on claims data collection, its transformation, accumulation, and reporting. MHDO is the nation's first statewide All Payer All Provider Claims database and has been collecting claims data since 2003. Other states have adopted Maine's model for collection of all claims data from all payers.

To collect and process all the data from all the payers and then make it available to stakeholders and citizens of Maine, MHDO has defined processes that helps in accepting the data from wide array of payers. In addition it has also defined processes to accumulate the data and making it available for reporting and analysis.

7.1.2   BUSINESS PROCESS

As discussed earlier, MHDO collects data from commercial payers, Medicare and Medicaid agencies. The path of the data from source each of the above mentioned sources to finalized MHDO database is different. The diagram below describes this path.
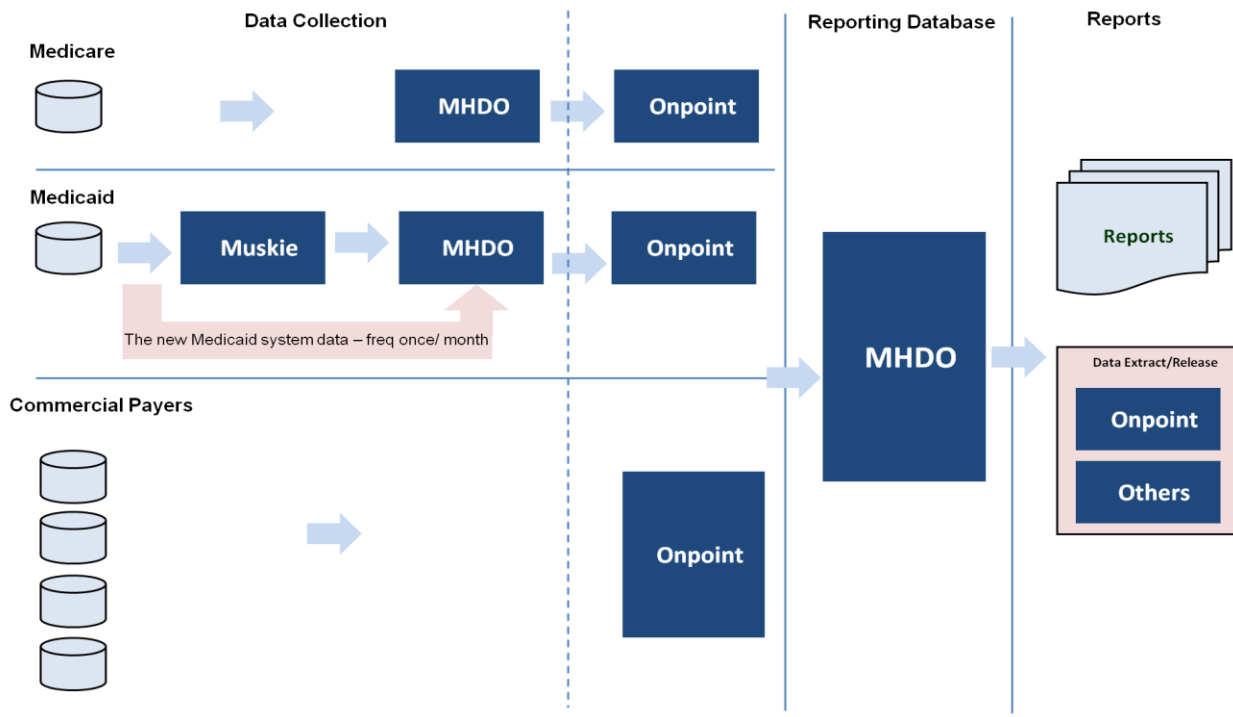
Figure 2 – The data flow from source to MHDO database

The first step of the process is data collection from source system. Medicare data is sent by Center for Medicare and Medicaid (CMS). The Medicaid data is sent by Office of MaineCare Services (OMS). The commercial data is sent by all the payers who have 50 or more members in state of Maine. Onpoint combines the data from each of these sources and sends it MHDO. This data is then made available to consumers and stakeholders. Onpoint also buys the data, like any other organization, for analytical purposes. The following sections discuss the process of data collection from each of these data sources.

7.1.2.1 Medicare Data

The Medicare data is purchased by MHDO from CMS and received annually. As of now there is 2-3 years delay in availability of data from CMS. The latest data MHDO has received is for year 2007. The year 2007 data is currently in data transformation stage (as mentioned in below graphic). The following graphic describes the process of data collection through making the data available for stakeholders.
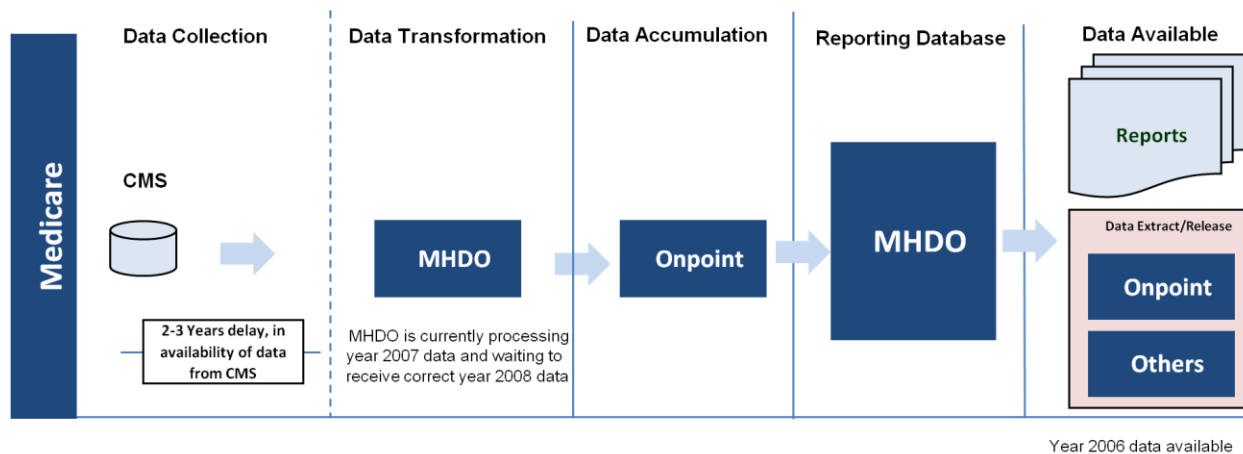

Figure 3 – The Medicare data flow

Once the data is received by MHDO it is converted into a format that is compatible with commercial claims data and sent to Onpoint. The goal is to complete this conversion in about 7 days; however it is dependent on MHDO receiving the data in correct format. Once the data is received by Onpoint, it is merged with other commercial claims and Medicaid data. Onpoint requires 60 days to complete its processing. Once the combined data is received by MHDO, it needs another 30 days to make it available for reporting and to other stakeholders.

This process is different from commercial because CMS sends the Medicare data in a format that is different than commercial claims data structure. MHDO converts into a commercial consistent format before sending this to Onpoint.

7.1.2.2 Medicaid Data

Similar to Medicare data, Medicaid data is received by MHDO for transformation into commercial claims compatible format. The data is then sent to Onpoint to merge it with other claims data and then it is sent to MHDO to be released to stakeholders and public. The diagram below shows the process flow of data collection.
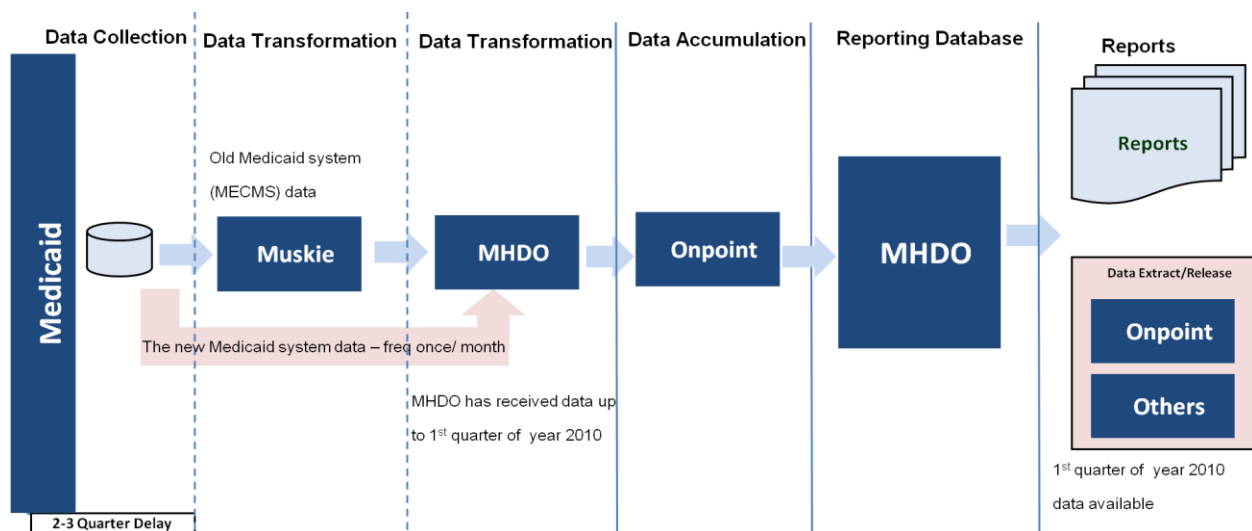

Figure 4 – The Medicaid data flow

The Medicaid data is sent by OMS and currently it has two paths to MHDO for transformation. Due to the problems with old Medicaid system, the data is sent to Muskie for initial transformation and Muskie in turn sends the data to MHDO for final transformation. However, the Medicaid agency has implemented a new system on 9/1/2010 and the data from this is to be sent directly to MHDO. The old system will continue to process the claims for date of service prior to 9/1/2010 until 1/31/2011 and as a result MHDO will receive the Medicaid claims data from the two sources. Once the claims processing in old Medicaid system is stopped, MHDO will only and directly receive the data from Medicaid system. The data from old system is sent every quarter and as of now there is a delay of 2-3 quarters. The goal for the new system is to send the data every month to MHDO.

Once the data is received by MHDO it is converted into a format that is compatible with commercial claims data. Once the conversion is complete the data is sent to Onpoint. MHDO has a goal of completing this conversion in 7 days. Once the data is received by Onpoint, it is merged with other commercial claims and Medicaid data. Onpoint requires 60 days to complete its processing. Once the combined data is received by MHDO, it needs another 30 days to make it available for reporting and to other stakeholders.

This process is different from commercial because OMS sends the Medicaid data in a format that is different than commercial claims data structure. MHDO converts into a commercial consistent format before sending this to Onpoint.

7.1.2.3 Commercial Claims Data

Commercial payers directly submit the data to Onpoint. Onpoint validates the data in accordance with chapter 243 of CMR 90-950 and then combine the data from all payers and send it to MHDO to be made available to stakeholders and public. The diagram below shows the process flow of data collection.
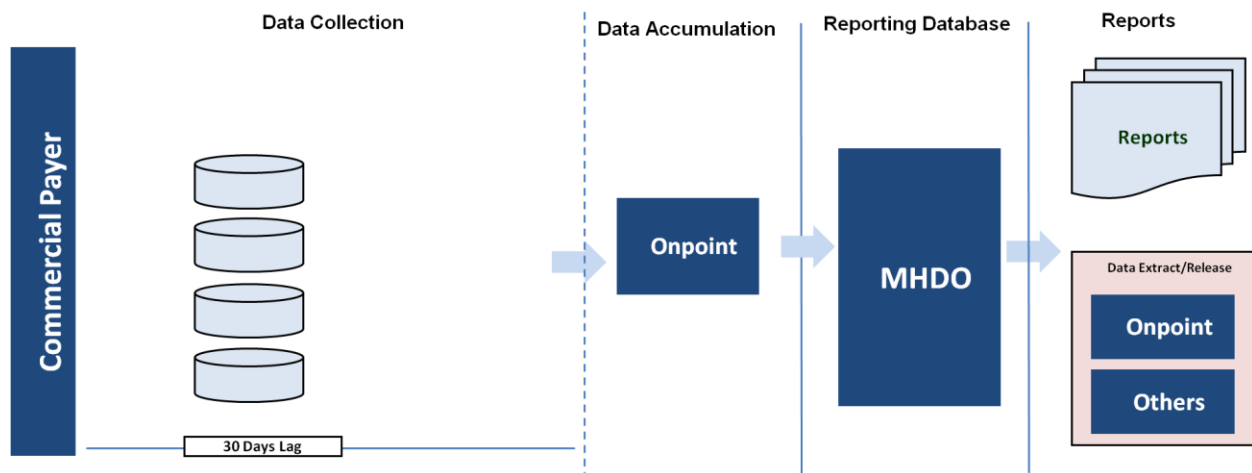

Figure 5 – The commercial claims data flow

The first step of data collection is data submittal by commercial payers. The data is uploaded via a web tool and for the most part is working well today. If a payer submits 3 files every month they have to upload each of the files individually. There are 97 individual commercial payers who submit data to MHDO on a frequency based on their membership in state of Maine (it is described in section 5.2.1). They submit a total of 3,485 files every year. The split of these submissions by frequency is as follows:

1. Monthly submissions – 68 commercial payers submit a total of 3,300 files
2. Quarterly submissions – 12 commercial payers submit a total of 140 files
3. Yearly submission – 17 commercial payer submit a total of 45 files

As mentioned earlier, the yearly submissions are required by payers who have 50 or more members but less than 500 members in Maine. The volume of these claims is less than 1% of total claims.

Once the data is received by Onpoint it goes through a series of validations described in section 6.3. The quality edits are performed on the data files received from submitters. These edits include preliminary checks for file structure and header/trailer validation, load level threshold checks and data element level threshold checks. Threshold settings are very detailed and can vary by payer. The MHDO team drives the business rules, such as threshold settings. The payers / data submitters have little or no visibility into these threshold settings and this has created gaps in understanding of these business rules on the part of payers. In addition, the changes to thresholds and/or rules are not done with payer inputs and communicated effectively with them.

There is a 30 day period to submit adjudicated claims at the end of each submission period, irrespective of the frequency of submission (monthly, quarterly or yearly). Onpoint requires 30 days to process, combine with other payer/Medicare/MaineCare data and send to MHDO. Once the combined data is received by MHDO, it needs another 30 days to make it available for reporting and to other stakeholders.

7.1.3 PROJECT MANAGEMENT

The project management and processes associated with it is one of the most critical components to meet the goals of organization and needs of its stakeholders. As described in section 7.3, MHDO organization doesn't have a lot of layers. As a result, no one is currently responsible for day-to-day project management focusing on planning, managing, scheduling projects and resources and oversee the daily activities. Current MHDO leadership and staff members are managing some of these tasks in addition to their other assigned tasks. Typically project management consist of the following disciplines

1. Integration Management
2. Scope Management
3. Time Management
4. Cost Management
5. Quality Management
6. Human Resources Management
7. Communication Management
8. Risk Management
9. Procurement Management

The following describes the purpose of these disciplines and the status of these in MHDO organization.

7.1.3.1 Integration Management

The objective of this discipline is to create project charter that describes the business need, develop the integration strategies to meet the business needs and implement the strategy. This also includes technical management, implementation of Software Development Life Cycle (SDLC), change management and release management.

Currently within MHDO, the process exists to define the projects and tasks. However there is no formal process to create the detailed business needs and review and finalize them with stakeholders, as necessary. In addition, the implementation of SDLC (i.e. requirements, design, develop, test and operate), is people dependent.

The change management process between MHDO & Onpoint and Onpoint & stakeholders is not clearly defined. As a result changes can be made without determining the complete impact across all stakeholders.

Similarly the release management process is not clearly documented and it is people dependent versus process driven.

7.1.3.2 Scope Management

The objective of this discipline is to completely describe the scope of the project and create work breakdown structure and then identify the deliverables to meet the scope. Every activity of the project should be performed to meet the defined scope.

Within MHDO, the scope of the projects is defined, however work breakdown structures, deliverables to meet the scope are not formally defined and tracked.

7.1.3.3 Time Management

The objective of this discipline is to define the work activities needed to produce or update the project, subproject, or team deliverables (scope) within the specified time frame (time), using available resources (cost), and meeting performance and technical standards (quality).

Within MHDO, the timelines for the project are established; however the necessary details like deliverables, intermediate goals, and activities to meet those goals are not clearly identified. The lack of detail results in insufficient tracking and resulting in consistently not meeting the goals.

7.1.3.4 Cost Management

The objective of this task is to produce a strategy for reaching budgetary goals that includes a budget estimate and financial policies.

The budgetary goals are identified with breakdown for high level activities. However insufficient scope and time management may have a negative impact on the budget.

7.1.3.5 Quality Management

The objective of this discipline is to document the procedures for managing and controlling the quality of the project and the expectations of the client organization, conduct the quality assurance and client satisfaction activities, and monitor the quality assurance activities and the client organization's expectations.

The procedures for maintaining and managing the quality are not clearly documented or followed. This includes both technical tasks and business process related tasks. Most of the processes are people dependent resulting in inconsistent outcomes.

7.1.3.6 Human Resources Management

The objective of this discipline is to produce a high-level view of the project organization and to determine the composition of the project or program management team, the project support staff, and the project team.

The high level organization structure is defined however, all the roles that are needed to meet the organization and business needs are not defined. In addition all the roles are not assigned to individuals. In addition there is dual reporting for certain team members resulting in shifting of priorities which may lead to not meeting the goals of organization and business needs.

7.1.3.7 Communication Management

The objective of this discipline is to produce a plan and perform the activities and execute the processes that must be performed to manage the timely and appropriate generation, collection, distribution, and storage of project information.

There is no clearly defined communication plan that establishes channels and frequency of communication among team and stakeholders. As a result most of the communication is ad-hoc and not comprehensive. There are no regularly planned status meetings between MHDO and Onpoint to discuss the current state and plan for next set of activities. Similarly, there is no regular communication to stakeholders.

The rule making process for data submissions is clearly defined and communicated effectively to stakeholders. However, there is no regularly planned communication with data submitters, where changes and future plans could be discussed.

7.1.3.8 Risk Management

The objective of this task is to initially prepare and subsequently execute the plan to manage the factors (positive and negative) that may affect the outcome of the projects.

The risk management plan is currently not defined.

7.1.3.9 Procurement Management

The objective of this task is to prepare a plan and then execute that plan in order to manage the engagement contract and meets its specifications.

Currently a contract between MHDO and Onpoint exists. This contract defines the high level activities and expectations. However the detailed activities, expectation, Service Level Agreements (SLAs) are not defined and clearly established.

7.1.4 STAKEHOLDER INPUTS

Inputs from stakeholders have been obtained to get their perspectives on the current state of consistency and specific pain points. Stakeholders included payers, users, and purchasers of MHDO data.

Payers have identified certain complexities in applying business rules to data. There are cases wherein different rules would apply based on data values contained in certain fields. In such cases, there are some inconsistencies on how those rules can be applied to Maine. These rules are not documented in MHDO chapter 243 of CMR 90-950. Payers have identified that Chapter 243 applies general guidelines and no business and data rules are provided. Data element threshold settings are not part of the rules defined in Chapter 243 of CMR 90-950, however they are part of handbook developed by MHDO.

Payers have also communicated that they are not being made aware of changes in data threshold settings; these changes are often realized after the fact. There are some inconsistencies in threshold settings and this is a common problem across states. There are cases where files that passed validation in the past year are now failing validation. There are also situations where files that failed validation have been passed without any intervention from the payers.

Data users and purchasers have voiced a concern that they cannot get access to the data. Users have requested more insight into the type of data existing in MHDO and when information would be made available. Users have requested to be notified of measures taken to avoid data delays. Other issues that were brought up included delays in Medicare claims data distribution and better communication of steps taken to prepare data in response to data requests.

Maine Health Management Coalition has raised concerns about not being able to get the claims data – they have requested claims data in Jan-2010 and they are still waiting on it. As per their estimates 30-40% of their strategic initiatives have been delayed due to unavailability of data.

Some of the stakeholders also want MHDO to make claims data available sooner than three months, as per the current process. However, if the data is used sooner than that it will be incomplete data – based on the analysis performed, only 50% of the claims are adjudicated within 1 month of service provided and another 35% in 2nd month. This is the limitation of claims data currently available to MHDO and if stakeholders are to use this data for analysis, they will need to allow for this limitation. In addition, the payer group also mentioned following limitations of claims data:

1. No or limited outcome data (lab results, radiology results, or CPT Category II code) for clinical outcome measures
2. No or limited race/ethnicity information for disparity study
3. No or limited patient lifestyle or behavior data like smoking, drinking, exercising, etc.
4. Lack of cost data at claim/service level for capitated HMO services
5. Premium cost is not available in claims data
6. Data accuracy - provider coding issue, up coding

Another issue that is impacting all the stakeholders pertains to National Provider Identifier (NPI) not available for servicing providers on all the claims. This impacts the overall analysis of claims data.

Payers have expressed concerns on incompleteness of data, push to produce client specific data and on being ready for ICD-10 and HIPAA 5010 initiative.

7.1.5 SUMMARY

MHDO has certain limitations in its business and project management processes. In addition, MHDO currently has limited system and process documentation, which prevents from being able to share knowledge amongst team members. Apart from gaps in effective levels of documentation, the team also does not have a document sharing repository such as Microsoft SharePoint.

No current data interface agreement exists between Onpoint and MHDO. This has created ambiguity in interpretation and application of data rules and thresholds. There are also data quality issues in the claims data sets which range from data type issues, missing required data elements and incorrect data values. This could be attributed due to lack of clearly defined data rules, specifications and expectations for data exchange between Onpoint and MHDO.

MHDO currently has no established processes around issue and defect tracking for data, system, code, requirements and vendor related issues. There are no system and integration testing procedures being followed. There is also no dedicated staff for testing activities. Lack of established testing and quality assurance procedures can cause data quality and performance issues and can prevent critical issues from being discovered in time.

There is no established change management strategy at MHDO. Changes are managed ad-hoc without an effective change control mechanism. Payers have communicated that no standard methodology exists for making changes to thresholds.

MHDO also needs to adopt an effective communications strategy such that all stakeholders including data submitters and vendors are made aware of any proposed changes well in advance. This would allow the stakeholders to plan and engage in impact assessment activities and make any necessary changes to their systems so that the transition to the new changes is smooth.

7.2   TECHNOLOGY OVERVIEW

MHDO primarily uses Microsoft technologies for its database, operating systems, ETL (extract, transform and load) solution and reporting needs.

7.2.1   OVERVIEW

MHDO Software Technologies:

MHDO currently uses the following technologies to support data processing needs:

- SQL Server database version 2005 for storing all claims data
- SSIS (SQL Server Integration Services) for ETL and reporting functions
- Flat file interfaces for receiving data files from data providers (e.g. Onpoint) and reports
- FOXPRO database for storing hospital outpatient data
- QBasic for storing Hospital Inpatient data
- Two websites (Health Cost/Health Web) that deliver online hospital and financial data (ASP technology)
- T1 network infrastructure
- Microsoft Access database and Excel

MHDO Hardware Infrastructure:

Server Name	Make	Model	Operating System (OS)	OS Version	Server Use
MHD-HCA1DB00001	DELL	POWEREDGE 6850	WIN/2003	WEB EDITION	SQL SERVER
MHD-HCG1AS00002	COMPAQ	Proliant DL 360G2	WIN/2000	STANDARD	SQL SERVER
MHD-HCG1AS00003	COMPAQ	Proliant DL	WIN/2003	STANDARD	INTERNET SERVER
MHD-HCG1FS00001	DELL	Proliant P4400	WIN/2003	STANDARD	INTERNET SERVER
MHDHCA1FSMHD	COMPAQ	Proliant 360	WIN/2003	STANDARD	FILE STORAGE

MHDO currently houses the following types of data stores and as of Nov 19, 2010 following data is available:

- Hospital inpatient (1980 through 3rd quarter of 2009)
- Hospital outpatient (1988 through 4th quarter of 2008)
- Hospital emergency department (1988 through 4th quarter of 2008)
- Hospital financial (2000-2004, 2005 to present, usage of standardized template)

- All provider/all payer health care claims to include

    - Commercial claims (including medical, dental and pharmacy) 2003 through 3rd quarter 2009
    - Government claims (including Medicare and Medicaid)
        - Medicare 2003 through 2006
        - Medicaid 2003 through 3rd quarter of 2009

- Quality data (2005 through 4th quarter of 2009)

- Hospital organizational data (2007 through 3rd quarter of 2009)

- Prescriber opt out registrants data (beginning 2008)

- Reference Code data sets that include eligibility, provider master/detail and medical/dental billing files 2003 through 2nd quarter 2010

7.2.2 CURRENT STATE ARCHITECTURE

The following discussion on MHDO architecture applies to claims data processing only.

The present arrangement between Onpoint and MHDO for data exchange is currently along the lines of a 'Push' based architecture, wherein Onpoint is responsible for pushing the files via the 'File Transfer Protocol (FTP)' method to MHDO. The understanding is that Onpoint will provide the data files to MHDO on a quarterly basis.

Data files that are sent by Onpoint include both transactional claims data and reference code set data files. Data files are received by MHDO from Onpoint over an FTP server in the form of zipped, asterisk delimited flat files. The MHDO team downloads and unzips the data files before preparing the data for loading into the SQL Server DBMS. While these tasks have been carried out manually in the past, the team is currently working on automating these tasks. Some of these files are large and run into the gigabyte range. Due to the volume and size of some of these data files, data loads into the MHDO repository take up large amounts of time. The Onpoint team, which creates the data files using an extract process from the Onpoint Oracle based data repository, has reported that it takes several hours to FTP the data files over to the MHDO server. The following diagram depicts the current data architecture of MHDO.
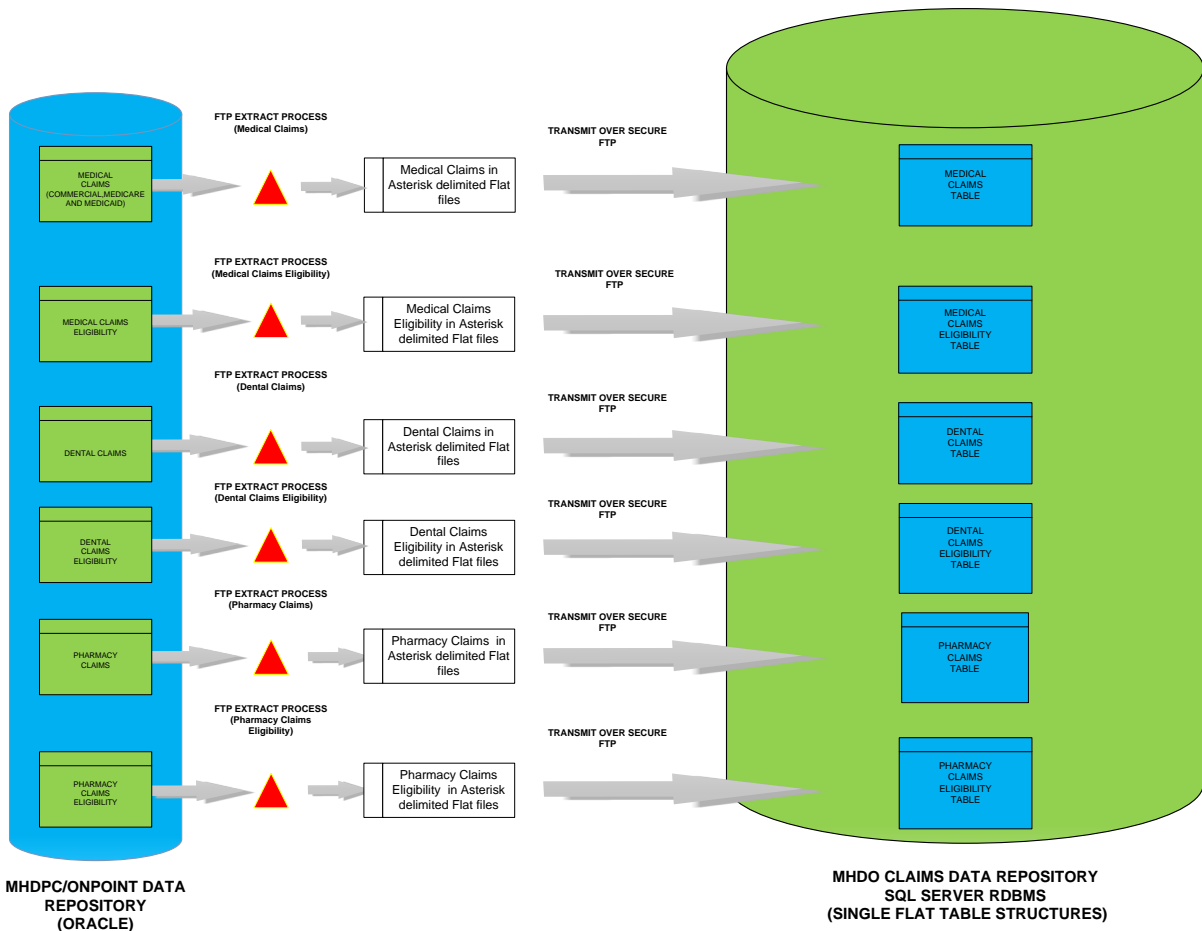
Figure 6 – The MHDO architecture

Claims data files once unzipped are loaded into flat table structures in the SQL Server DBMS via staging tables. The claims data repository in SQL Server DBMS is non relational and the tables are stand alone in nature. All medical claims data including commercial and government claims (Medicare and Medicaid) is stored in one physical table. Dental and Pharmacy claims are stores in their own physical tables.

In addition to the transactional claims data files, certain referential data files such as eligibility, provider master/detail and billing files are also stored in the SQL Server DBMS.

Current MHDO logical view shows basic existence of Date Warehouse (DW) architecture; however it lacks a few key components.
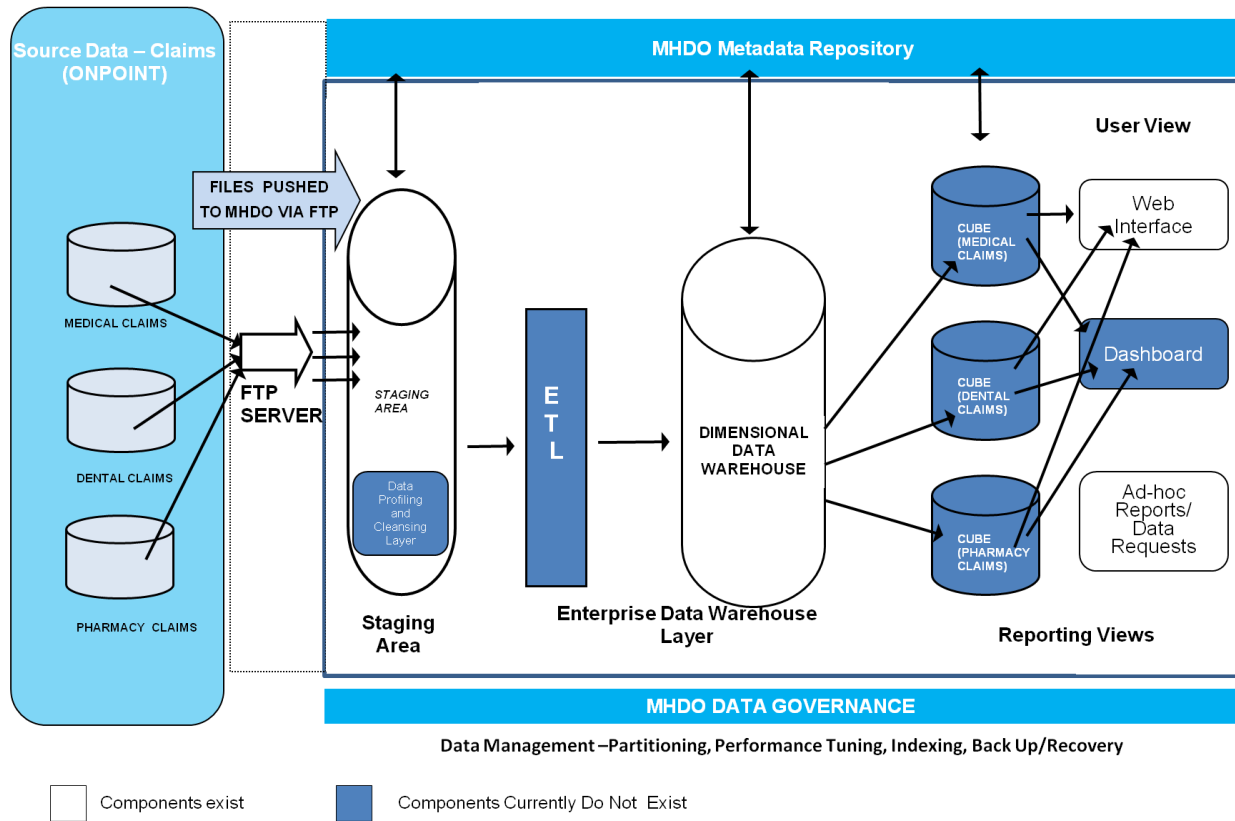
Figure 7 – MHDO logical architecture

The diagram above depicts currently existing and missing components of the Enterprise Data Warehouse architecture that MHDO should implement. Critical components missing include the Metadata Repository, Data Profiling and Cleansing Layer, Data Warehouse Layer based on dimensional design and Business Intelligence (BI) layer which provides reporting infrastructure around cubes, web interfaces and dashboards. Other components missing include key data management functions around partitioning, performance tuning and back up\recovery and a data governance structure that governs policies around data definitions, standards and security.

Claims Data Volumetric information (as of Nov 19, 2010):

Database Table	Row Count
Dental Claims	12, 869,972
Dental Eligibility	51,213,089
Medical Claims	211,254,923
Medical Eligibility	84,962,627
Pharmacy Claims	88,655,872
Pharmacy Eligibility	89,936,150

As noted above, claims data volumes in the MHDO SQL server database are extremely high. In the case of Medical claims data, there are over 200 million rows of data. Pharmacy claims amount to around 90 million while dental claims amount to around 13 million.

Given these large data volumes, tasks related to database management such as performance tuning, partitioning and indexing are essential to prevent significant performance issues. With the current architecture as-is, any queries written to extract data from the tables may result in full table scans which would take up large amounts of time and cause significant performance issues.

7.2.3 REPORTING

Current reporting requests are handled on an ad-hoc basis and the data is extracted from the claims database tables using queries. Report data is delivered to users in the form of flat files or other requested forms.

The MHDO team has reported performance issues in extracting data from flat table structures that contain huge volumes of claims data that stores historical claims data. Extraction of data from non partitioned tables containing years of history requires huge amounts of resources and can be a huge performance overhead.

In order to provide a more robust and analytical framework, MHDO needs to design and implement a data warehouse repository based on principles of dimensional modeling and industry leading best practices.

MHDO also lacks an integrated view of patient profiles across the domains of medical, dental and pharmacy claims. Having an integrated view across these domains will help understand utilization and treatment trends and help strategize preventative care initiatives.

7.2.4 SUMMARY

The MHDO team has reported issues in the quality of claims data that it collects currently. Data quality issues reported includes missing required data values, incorrect data values, data type, and size inconsistencies. The team has reported that the rules as defined in chapter 243 of CMR 90-950 are not being adhered to in the data files being received by MHDO from Onpoint. The MHDO team has also reported that certain rules that are defined in chapter 243 need to be revisited and rewritten. Quality issues in the data received are causing data load issues and preventing loads from being completed in time. Examples of data quality issues found in data elements are incorrect or invalid NPI numbers and product codes. The MHDO team communicates data issues found during the load process to Onpoint and the method of communication is currently email and telephone. Lack of a formally defined and agreed upon interface between Onpoint and MHDO causes frequent issues in interpretation and conformance.

The team has also reported performance issues in loading data into the database, which could be attributed to data volumes and underlying quality of data. Performance issues have also been raised during the process of extracting claims data from the tables for reporting purposes. Since the current levels of documentation are poor, the team has no reference points and has to dig through the code to investigate any issues.

MHDO currently acquires data files from Onpoint via a flat file based FTP interface. Lack of a clearly defined and agreed upon interface agreement between MHDO and Onpoint is currently the root cause for several of the issues surrounding data quality. The data files are large in nature and sent on a quarterly basis.

MHDO currently lacks a robust data profiling approach. Currently, data quality issues are being identified using a reactionary approach (after the fact), rather than on a proactive basis.

MHDO has no current documents capturing its data acquisition and ETL architecture standards and processes. There is also no metadata repository being maintained.

The current data architecture at MHDO is not tuned to provide the full range of capabilities to its users. The table structures are flat, non-relational and non-integrated. All medical claims data from commercial and government sources are stored in one physical table. Given the volume of these data files and the fact that MHDO has been storing claims data going back several years, the current architecture is not geared to support MHDO's data processing and growth needs.

7.3 PEOPLE OVERVIEW

MHDO organization is flat and includes its staff and persons from the Office of Information Technology (OIT). The attached diagram has the organization structure.
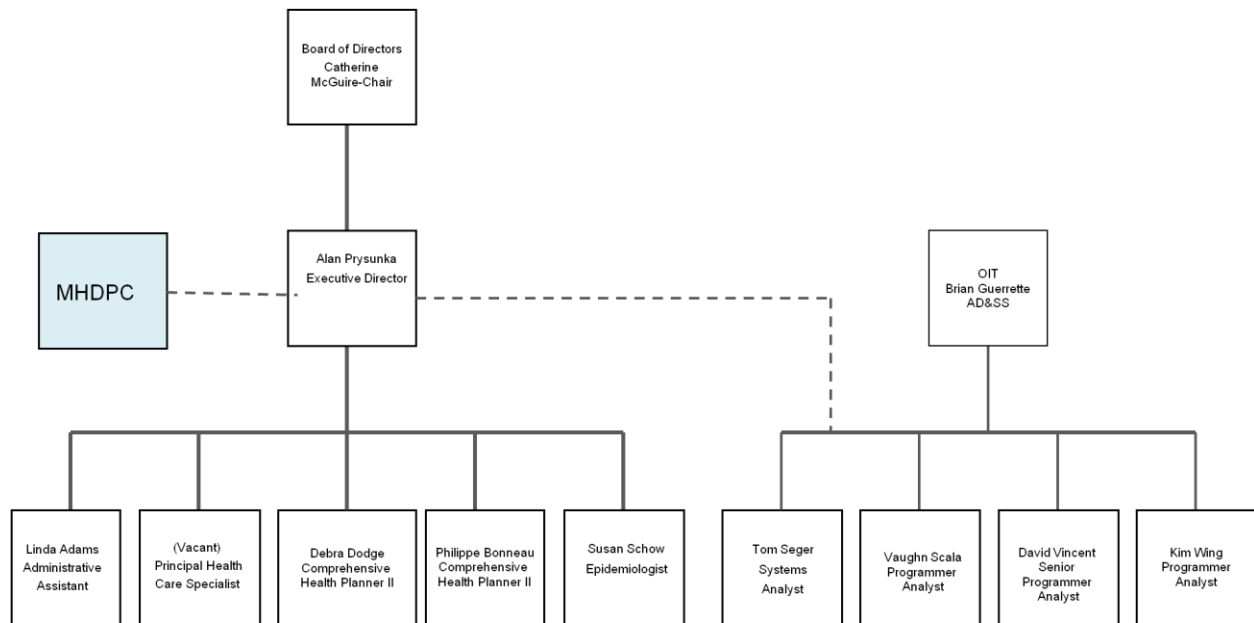
Figure 8 – MHDO organization structure

MHDO is governed by a 21 member policy board consisting of the following representatives:

- 4 consumers
- 3 employers
- 2 third-party payers
- 9 providers (2 hospital; 2 physician; 1 chiropractor; 1 pharmacist;1 ambulatory care; 1 home health care; 1 mental health)
- 1 Department of Health and Human Services (appointed by DHHS Commissioner)
- Executive Director of Dirigo Health
- Commissioner of Professional and Financial Regulation (nonvoting, consultative member)

The current MHDO staff comprises of 10 employees, out of which 6 are full time MHDO staff and 4 are from OIT (Office of Information Technology).

MHDO tasks that are technical in nature are handled by a team consisting of a senior programmer analyst, a systems analyst and two programmer analysts. The technical team handles tasks surrounding claims

data acquisition and load processing, hospital inpatient and outpatient data processing, hospital financial data, compliance from data integrity perspective, web site maintenance and reporting.

Tasks related to claims data processing are the most critical tasks undertaken by the team today.

Critical tasks that the team performs in this regard are as follows:

- Retrieve data files sent by Onpoint from the MHDO File Transfer Protocol(FTP) server (files are sent in zipped format and need to be unzipped; all data files including transactional claims and reference code sets are in the form of asterisk delimited flat files)
- Load the data files into the MHDO SQL Server data base; related tasks include programming and tuning of data load jobs
- Manage the SQL Server DBMS for tasks related to administration, maintenance and tuning
- Communicate with Onpoint on issues surrounding timeliness, quality and compliance related aspects of data received
- Make the data available for release
- Perform tasks related to reporting requests(including ad-hoc, scheduled and mandated)
- Verify the compliance of data and policies from data integrity perspective
- Prepare Medicare and Medicaid files for submission to Onpoint

Claims data processing tasks related to ETL (Extract Transform and Load) using the SSIS tool, database administration (SQL Server database), related programming and data request processing are handled by two staff members for the most part.

Hospital inpatient and outpatient data processing are handled by two staff members and these tasks require knowledge of QBasic and FOXPRO which are legacy technologies.

Hospital financial data is being received by MHDO in unstructured format for the most part and there is no dedicated data base to store this data in a structured fashion today. One staff member handles hospital financial data related tasks from a health planning perspective; however there is no dedicated staff member devoted to technical tasks for hospital financial data.

Compliance, reporting and web site maintenance tasks are handled by dedicated staff members. These staff members are very experienced and have the required knowledge to perform their tasks effectively.

Quality data processing is handled by one person. The tasks include receipt of data from hospitals and its aggregation and evaluation.

7.3.1 SUMMARY

Currently most of the staff is currently focusing on day-to-day maintenance and operations tasks. In addition current levels of documentation are poor and critical system functions and activities remain undocumented. Certain staff members performing critical tasks are no longer at MHDO and left behind little or no documentation. In the absence of any documentation, newer team members rely on the knowledge of senior technical staff to guide them with their tasks. Senior members are pulled into various activities and are frequently handling multiple tasks. Also, for some of the key roles and tasks, there is no single point of contact. For the most part knowledge and process is people dependent.

MHDO currently has no dedicated people for performing tasks related to SQL Server Database Administration. As a result, tasks related to server administration, maintenance and performance tuning are currently being handled by a senior staff member who is also tasked with performing critical claims data load processing. Lack of an assigned DBA has left gaps in important database maintenance and performance enhancement tasks such as database back up, disaster recovery, performance indexing and tuning and database partitioning. Activities such as database partitioning and tuning are important tasks that can help improve the performance of data load processing.

Similarly there are not dedicated resources assigned to Quality Assurance (QA) /Testing from a technical perspective. Lack of resources for these critical tasks has meant that critical system functionality has not been tested under rigorous system and integration testing methods. Defect and bug fixing methods are currently reactionary rather than proactive in nature. Lack of a bug and defect tracking and reporting mechanism has left the possibilities of code bugs and defects from being detected in time before the software is pushed into a production environment. The absence of a production like test environment is also a handicap in the current state.

There is no clearly identified role of Business Analyst(s) and as a result, there are gaps in being able to define a clear interface agreement between Onpoint and MHDO. Currently, the rules for data collection and submission by data provided to Onpoint are defined by MHDO in Chapter 243 of CMR 90-950. However, no agreed upon data interface agreement exists today between Onpoint and MHDO. The touch points between Onpoint and MHDO are mostly ad-hoc. Finally, the tasks of day-to-day project management are also not clearly assigned. The details of these tasks and impact are discussed in earlier sections.

8 RECOMMENDATIONS

Our recommendations to MHDO have been structured based on three components, namely:

1. Process,
2. Technology
3. People

These recommendations are based upon our understanding and observances of current state at MHDO, industry leading practices and Deloitte's expertise in the Data and Information Management space.

8.1 OUR RECOMMENDATIONS – PROCESS

8.1.1 ESTABLISH LEADERSHIP STRUCTURE

MHDO should establish a leadership structure (Leadership Team) that facilitates the collaboration among MHDO, OIT and Onpoint. This will serve as a mechanism and process for priority setting, decision making and monitoring of progress against the established goals. At the top of this structure would be an executive decision making body which should include leadership from MHDO, Onpoint and OIT. The roles of team leads and subject matter experts should be the next levels and include members from all the teams. Once these are set up the flow of responsibilities between different roles and team may be established, which will help in speedy decision making and issue resolution.

8.1.2 FINALIZE INTERFACE AGREEMENT BETWEEN MHDO AND ONPOINT

MHDO currently receives claims data distributed by Onpoint in the form of asterisk delimited flat files. These files are pushed to MHDO by Onpoint using the FTP method and most files are sent on a quarterly basis. There are multiple file types based on the lines of business supported the payers and these file types include eligibility, medical, dental and pharmacy claims. Medical claims include commercial, Medicare and MaineCare claims.

Some of these files are large in volumes and can contain up to 18 GB of data. There are many situations where the file transfer process takes several hours and in some cases the transfer takes almost an entire day. There are also issues with the quality of the data in terms of missing data elements, wrong data values, incorrect data types etc.

ONPOINT ACTION ITEMS:

To begin with, the Onpoint team needs to validate every one of its extract jobs/processes that are creating the claims data files in flat file format and distributing to MHDO to ensure that there are no missing data elements and wrong data values. Our understanding is that these extract jobs/processes pull the underlying claims data elements from the Onpoint data repository and create the flat files needed for distribution. Any bugs or defects in these extract jobs/processes need to be identified and fixed for all file types.

Establishing an interface agreement between MHDO and Onpoint is an important step in this direction. Once the interface agreement has been agreed upon and signed off, Onpoint needs to ensure that all claims data files conform to the interface specification and any issues in the quality of these files are identified and fixed as early as possible.

Onpoint needs to look into the feasibility of sending the claims data files on a monthly basis instead of the current quarterly schedule. This will help bring down the volumes of data files that need to be transferred over the network via the FTP method by almost a third and reduce the time taken for this process as well.

Currently the commercial file structure as defined in chapter 243 of CMR 90-950 is used as the format to capture all claims data for Medicare and Medicaid as well, in addition to the commercial structure. The interface agreement needs to capture all the data fields that are being used to capture data values in each of the situations. This needs to include fields that are common to all three claim types, and any fields which are borrowed from the commercial structure in situations where there are no well defined fields to house these values. As an example, Medicare claims could be using fields from the commercial structure that were originally intended to be used for a different purpose in the commercial world.

MHDO ACTION ITEMS:

The first step MHDO needs to take is to establish an interface agreement between the MHDO and Onpoint teams for claims data exchange. Currently, chapter 243 defines rules for data collection from data submitters. These rules are in force when data submission is done by payers and TPA's to the Onpoint repository. These rules are extended to the Onpoint-MHDO data exchange process on a mutual understanding basis without any formal guidelines and interface agreement.

The interface agreement needs to take into account all business and data rules for the underlying data, any special data handling and processing requirements, threshold level settings that would apply to the load process at the file level, any data quality edits and thresholds for certain critical data elements applicable to all data submitters, all service level agreements that would apply including timing and frequency of all files along with a communication strategy for dealing with any issues.

The data interface agreement may contain the following information as a guideline:

- List of data files, file types, data elements , data types, data rules and domain values
- Clear identification of required data elements and optional data elements
- Any interdependencies between data elements
- Header and Trailer record requirements for each file along with field names and definitions
- File naming convention along with a convention to identify if the file is brand new or resend of an earlier file
- Service level agreement defining the time, frequency and method of data transmission along with exception handling procedures
- Any special data handling requirements
- Threshold settings that are most commonly applicable to payers at the load level; Any settings that are specific to a payer needs to be documented and communicated separately; One method by which this can be done is by publishing links to the document location within the interface agreement
- Data quality threshold settings for certain critical data elements need to be documented in the interface agreement; Any exceptions will need to be documented as well and can be done so by establishing links to the document location from within the interface agreement
- Any other requirements that may need to be met from a MHDO, Onpoint or state mandate perspective
- Guidelines on compliance related aspects
- Contact information and escalation processes

8.1.3 IMPLEMENT PROJECT MANAGEMENT PROCESSES

Project Management, as described in section 7.1.4, includes nine disciplines. When these disciplines are implemented with sufficient rigor they make the processes repeatable and outcomes predictable. Based on our assessment of the current state and our understanding of

issues faced by teams within the organization and challenges faced by stakeholders, our recommendations are as follows.

8.1.3.1 Integration Management

As mentioned earlier, the objective of this discipline is to develop and implement integration strategies that includes technical management, change management and release management.

Technical Management – MHDO organization executes multiple projects simultaneously at any given time. These projects should follow structured Software Development Life Cycle (SDLC) that divides the entire project in following phases

1. Requirement definition – This phase will define and document the needs (it may be both business and technical) of the project and typically includes "what" needs to happen. At the end of this phase a Requirement Specification Document (RSD) is created, which becomes the driver for entire project.
2. Design definition – The input to this phase of the project is RSD, which is used to develop the design. This typically will include "how" the requirements defined in the prior phase will be met by either creating a new technical process or updating existing technical processes. At the end of this phase a Design Specification Document (DSD) is created. Before finalization of this document, it should be verified that DSD will meet all the requirements and only the requirements specified in earlier stage.
3. Development – The input to this phase of the project is DSD, which is used to make changes to existing functions within the system or create new functions.
4. Testing – Once the development phase is complete, a validation of changed functions or new functions should be performed against the needs documented in RSD. Only after the validation is complete changed or new functions should be put in to use.
5. Implementation – This is the phase when changed or new functions are put in to use in live environment. Depending on the functions, there is variety of ways it could be done – in a phased manner or in entirety, and it each of these would have different implication on system, end users and stakeholders.

There are multiple SDLC methodologies (waterfall model, rapid application development (RAD), joint application development (JAD), fountain model etc), which creates the above mentioned structure. We have no preference for any one, the important factor for success is to follow an agreed upon methodology. MHDO, OIT and Onpoint should together decide on one, which is documented and where there is an agreed upon and documented hand-off between above mentioned phases.

The advantages of using a SDLC are that every project goes through a structured process, which is repeatable and it makes outcomes (timelines, results etc) predictable. In addition, it also creates documentation which makes knowledge management within the organization easy. In the context of current situation at MHDO and Onpoint, it would make sure that all the changes to system or function go through entire process resulting in outcomes that are as per the expectations; the timelines are predictable and will provide intermediate milestones to monitor the progress. In addition it will also create a knowledge repository, due to documented hand-offs between each phases, that may be leveraged to supplement resources for a project, if necessary.

Change Management – This is a process, where changes to system, function and project are introduced formally and are approved after the due diligence. Change management is intended to manage those changes that affect both internal and external suppliers/users of the data.

- Internal changes are those that affect MHDO, Onpoint or OIT

- External changes are those that affect external stakeholders (suppliers or users) and MHDO, Onpoint or OIT

In the context of current situation at MHDO, for all of the changes that are requested a formal process should be developed to do the following

- Perform impact analysis on functions, processes and stakeholders to identify, document and verify the impacts.

- Governance Team approves, defers or rejects the change and its priority

- Communicate the change and its timelines to internal and external stakeholders

- Communication continues throughout implementation of changes.

The advantage of using this process is that changes are implemented after complete analysis. In addition stakeholders will always be aware of the changes that are being implemented – this was one of the biggest concerns raised by stakeholders.

This change management processes will support both the MHDO internal operations as well as rule changes established legislatively.

Release Management – The business processes and systems in MHDO are complex and as mentioned above, due to the business and technical needs, several changes are worked upon simultaneously. At any point there are several moving pieces that must fit seamlessly to guarantee the success. Release management is a software engineering process intended to coordinate these changes and flow them through the entire SDLC.

The advantage of this process is to be able to coordinate the changes to the system so that only agreed upon and verified systems changes are implemented.

8.1.3.2 Scope Management

The objective of this discipline is to make sure that every activity is performed to meet the scope of project. To achieve this, within MHDO, OIT and Onpoint we recommend that for every project there is a work breakdown structure created, which identifies all the activities and the deliverables of the project. These details will help ensure that activities within the project are only performed to meet the goals of the project.

8.1.3.3 Time Management

The objective of this discipline is to make sure that activities and deliverables defined in the above mentioned process are performed or completed within specified time. To achieve this we recommend that within MHDO, OIT and Onpoint the timelines are identified for completing each deliverable, achieving all the intermediate goals and all the activities. This will help in creating the realistic timelines that may be communicated to stakeholders and monitoring of projects on day-to-day basis.

8.1.3.4 Quality Management

Quality management is an ongoing process to meet or exceed the expectations of internal or external stakeholders through a structured and systematic process. In the context of MHDO, there are two components to this

1. Data Quality – There are several processes set up to make sure that data received from payers meet the expectations. This process is ensuring, for the most part, that rules established in chapter 243 of CMR 90-950 are met. Therefore we do not have any specific recommendations for this process.

2. Internal process and technical quality – This component relates to quality assurance processes for changes to the system and maps to 'Testing' phase of SDLC. MHDO, OIT and Onpoint should document the validation process that will include the overall process for assuring the quality or quality management plan. It may consist of, at a minimum, the various kinds of testing that will be performed for each of the changes. This may include unit testing, system testing, user testing and performance testing. For each of the changes, there should be a process to document the expected outcomes. All of the expected outcomes should be validated and verified before any change is implemented. The goal of this overall process is to make sure that changes that are implemented meets the specific needs established for changes, which may be both technical and business and comply with quality management plan.

8.1.3.5 Communication Management

The objective of this discipline is to create plan and perform the activities to manage a timely distribution of project information. A communication plan should be created that will include several different components. These are

1. Monthly Leadership meeting – The participants in this meeting should be leadership from MHDO, OIT and Onpoint. The goal of this meeting is to review the overall high level status, resolve any issues escalated from teams, make decisions on priorities and resources, plan for 3-6 months goals and provide guidance to teams accordingly and create strategies to communicate and engage with external stakeholders. Any issues that cannot be resolved should be sent to MHDO board for decisions and guidance. The leadership team may use status reports to guide the discussion.
2. Weekly team meeting – the participants in this team should be team leads, subject matter experts (if required) from MHDO, OIT and Onpoint. The goal of this meeting is to review the day-to-day status, outstanding issues (technical and business) and plan for 2-4 weeks. A weekly status report should be created that should be sent to leadership team. In addition, any issues that cannot be resolved should be sent to leadership for decisions and guidance.
3. External stakeholder communication – There should be a communication to external stakeholders using either web-site or mass mailing, providing them with the overall high level status, the current data available and any issues impacting them. In addition this channel should also be used to communicate the changes to business rules impacting them.
4. Ad-hoc communication – There should be a plan and communication channel that should be established to provide updates related to projects or changes impacting them, which may not be communicated in regular planned communication.

The advantages of these planned and proactive communication is that teams and stakeholders are always aware of the status of projects, issues and priorities resulting in teams and stakeholders being prepared for changes and issues.

8.1.3.6 Procurement Management

Currently the relationship between MHDO and Onpoint is formalized by the contract that defines high level activities and expectations. We suggest that contract should also include service level agreements (SLA) between MHDO and Onpoint. The SLAs typically include common understanding about service, priorities, responsibilities and timelines. Each of the service scope should have level of service defined. For example, Onpoint sends claims files every quarter to MHDO. The SLA in this case may be the day of the quarter when the files would be available. Similarly there may be another SLA on the data format and content. This would allow a clear set of expectations on agreed upon and measurable results and "output". The focus in this case would be on results instead of how service is delivered to MHDO.

Typically SLAs may be customer based or service based. In the present scenario, MHDO and Onpoint should have a service based SLA. This should consist of, at a minimum, the metrics related to timelines, content of data, performance measurement criteria, roles, and responsibilities of MHDO and Onpoint in regards to services and problem management agreement.

8.2 ESTABLISH DATA GOVERNANCE

A Data Governance Framework will facilitate establishment of data standards and provide better control and consistency in how projects are developing data/information models. It may be viewed as the overarching framework required in achieving data integrity.

MHDO collects claims data from data submitters and governs policies and procedures around how data needs to be submitted. Establishing a data governance framework will provide the foundational elements for consistency of data definitions, quality and use of data and metadata, data security and privacy, data lineage, meeting regulatory requirements, business transformations etc.

MHDO establishes the roles & responsibilities, organization structure, and clear ownership for data modeling practice.

Governance Metrics establishes measures for monitoring adherence to the data modeling standards and processes.

Implementation Model includes the implementation patterns and methods and engagement models..

Policies refers to guidelines and principles for enforcing data modeling standards and data model governance processes.

Tools & Technology establishes the Tools, data models, high-level architectures, implementation options, and roadmap to enable the enforcement and adherence to recommend data model standards.

Process & Procedures Establishes guiding principles outlining how data models are created, modified and maintained, enabling accurate data models to be leveraged across Segments.

Organization

Governance Metrics

Implementation Model

Policies

Tools & Technology

Processes & Procedures

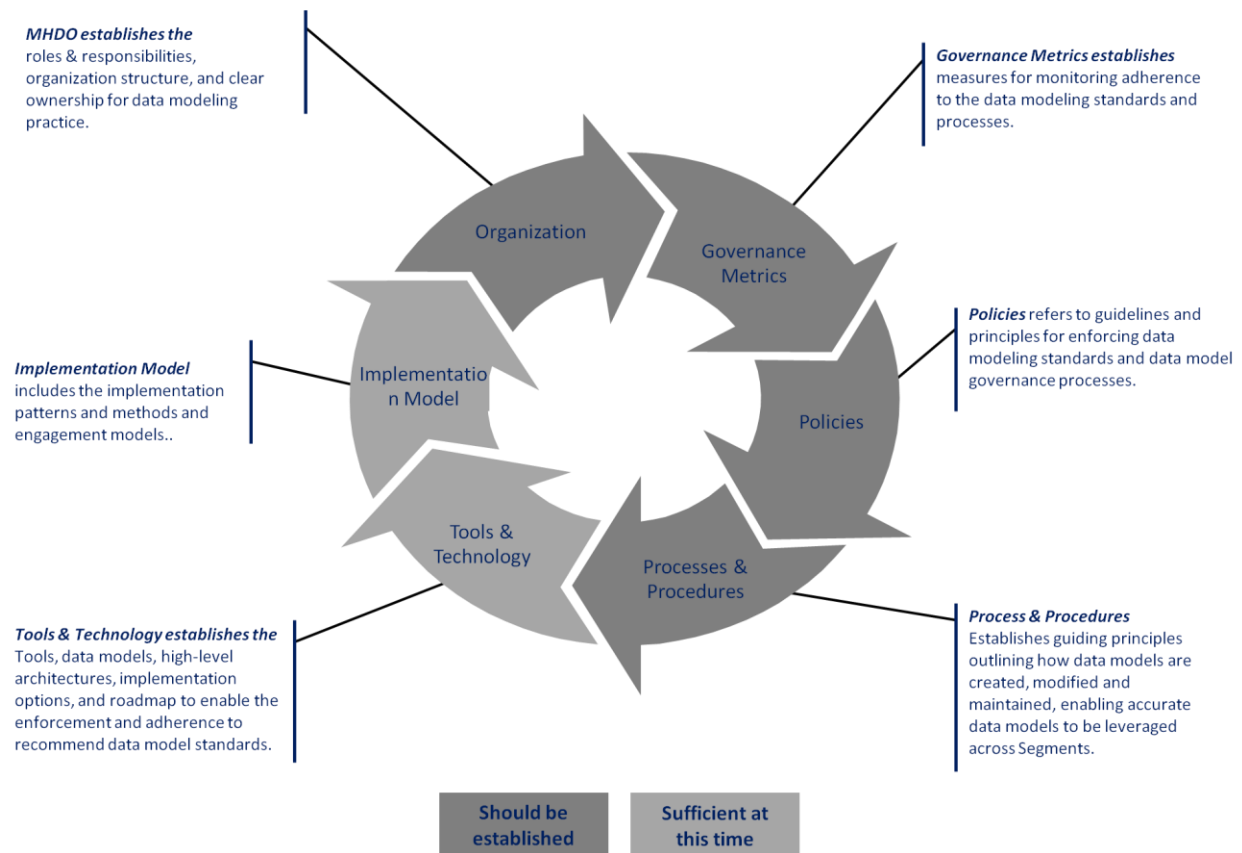**Should be established**

Sufficient at this time

Figure 9 – The data governance framework

This framework has six components and initially MHDO should focus on four components. The first step is to create an organization, with clear roles and responsibilities and ownership of data modeling practices. The next step is to establish metrics to monitor and measure adherence to data modeling

standards and processes. The next step is to establish guidelines for enforcing standards and processes. The final component MHDO should focus on is to establish principles and guidelines for creation and maintenance of data models.

A Data governance framework will also address data backup and retention strategy and change management processes for data use and management.

The data governance framework will need to identify policies and procedures for the following:

- Business Glossary consisting of Data Definitions – part of this already exist, however these need to be make current and a process should be developed to keep them up-to-date
- Data standards around naming conventions, data models and metadata
- Data quality standards for accuracy, accessibility, consistency, and completeness of data along with collection of metrics using techniques such as data profiling to measure and assess quality of data – this will also include timeframes of when the processes occur achieve these goals
- Data Monitoring, Security and Privacy standards
- Data Archival and Retention strategies
- Policies to ensure compliance by data submitters and any state mandated legislature – this process currently exists and can be incorporated in the framework
- Data administration, Data Management and Data release policies
- Tools and technologies, for the most part exist however the usage of these may be made more robust

This framework defines the data model governance capabilities that will enable MHDO to better govern and support data management practices and policies. Resources that are typically involved in the establishment of a data governance framework include executive sponsors from the board, the leaders of the organization, the project manager, business analyst and staff members including those responsible for quality and compliance within the organization.

The benefits of data governance are multifold and organizations across industries have identified benefits from this approach.

8.2.1 SUMMARY

The goal of all the process related recommendations is to create an effective project management and governance structure, which will facilitate in creating predictable outcomes and communicate them effectively and in timely fashion to all the stakeholders.

8.3 OUR RECOMMENDATIONS – TECHNOLOGY

Our technology recommendations have been divided into sections based on ETL (Extract, Transform and Load) Architecture, Data Architecture (including Data Warehouse architecture and Data Architecture standards) and Reporting.

8.3.1 IMPLEMENT ETL ARCHITECTURE

The choice of ETL architecture is a fundamental and important decision in the design of the ETL system. The choice of architecture impacts data processing, efficiency and performance. In order to arrive at the best fit architecture, a number of factors need to be considered. These factors include source system data structures, data volumes, quality of data, complexity of business and data rules and service level agreements. For an existing system, it is essential to understand the current architecture and identify any existing gaps that need to be addressed.

The recommendations in this section are being made taking into account industry leading practices in ETL architecture including claims data collection and reporting architectures, current architecture in use at MHDO for claims processing, identified gaps in current architecture and the business and growth needs of the organization .

BUS DRIVEN ARCHITECTURE:
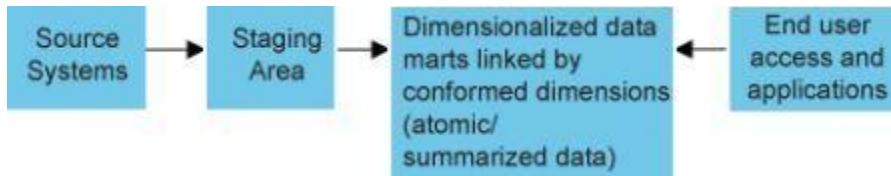
A bus driven ETL architecture is an industry leading practice recommended by Ralph Kimball, a note architect and author in the field of data warehousing and business intelligence. This architecture has been adopted by several states and commercial payers processing claims data. A bus driven architecture provides the necessary architectural foundation for a more robust analytical platform for end users.

The key components of Kimball's bus driven architecture include the source system, the staging area and the data warehouse consisting of data marts based on the principles of dimensional modeling. A key architectural aspect of the data mart is that each mart is based on a star schema, which consists of a centralized fact or measure table surrounded by a series of dimensional tables. The fact table contains factual data (such as the total number of claims paid) whereas the dimensional tables contain reference data elements or report headers (such as name, address, location, age, gender etc.)

The logical union of data marts constitutes the data warehouse. Each data mart is said to be a subset of that data warehouse. Business processes can be plugged in to expand the scope of the data warehouse as needed and this flexibility is a key benefit. Summarized and atomic data can both be stored in the star schema model. Conformed dimensions can be looked upon as plugs and data marts throughout an enterprise can "plug into" this bus to receive the dimension they need. Meta data forms the basis of the data hub.

SOURCE SYSTEM:

Source systems provide the data that feeds into the data warehouse. For MHDO, Onpoint is the only source system from a claims data perspective and provides all the claims data including commercial, Medicare, MaineCare, dental and pharmacy claims data.

A key consideration for source systems is the data acquisition piece. Data Acquisition is the process of acquiring data from one or more source systems. It addresses methods of acquiring data such as "Push" or "Pull" along with frequency; technology and method of data capture (full or incremental data capture).

Methods of acquiring data include i)Data files – XML files, CSV files, flat files (delimited and fixed width files), ii)SQL adapters and ODBC drivers for relational data base source systems and iii)Messaging Queues – IBM MQ series, middleware like TIBCO, Neon and Tuxedo.

MHDO acquires data from Onpoint using the "Push" methodology, where in Onpoint "pushes" the data to MHDO via an FTP interface. Please refer to section 8.1.1 for recommendations related to the interface agreement that impact the data acquisition process between MHDO and Onpoint.

DATA STAGING AREA

The data staging area is responsible for storing and preparing the data prior to loading the data warehouse. In addition to this, data quality checks are also carried out in the data staging area to ensure data is accurate and correct before loading into the data warehouse environment. Data quality checks are essential to prevent delays due to data reloads and delivering poor quality data to decision makers.

Currently MHDO has a data staging area which is used to store and prepare the data received from Onpoint for loading. However, no data quality checks are being performed in the staging area currently, when the data is received by MHDO.

8.3.1.1 DATA PROFILING AND DATA CLEANSING

Data profiling is an important data quality task that identifies rule violations, structural violations, data rule violations and any invalid values. Data profiling cannot identify any inaccurate data can pass all rule tests and still be wrong.

Data Warehouse projects should define a data quality policy which can be categorized to be handled by the ETL data quality subsystems as shown below.
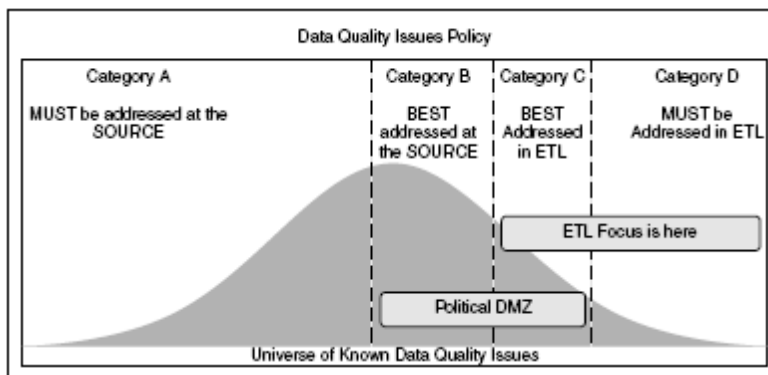

Figure 10 – The data quality issues by stages

Category A: Issues for whatever reason that must be addressed at the source.

Category D: Issues that can be resolved pragmatically by the ETL. Like incomplete information from third party suppliers that can be corrected through integration or correction of data from an inflexible operational source systems.

Category B: Issues that can be addressed at the source even if there might be creative ways of deducing or recreating the derelict information.

Category C: Issues that are best addressed at the ETL rather than the source.

Data quality checks that can be performed during the data profiling stage can be categorized into the following types:

- Column Property Checks
- Null values in required columns
- Numeric Values that fall outside of expected high and low ranges
- Columns whose lengths are unexpectedly long or short
- Columns containing values outside a data set
- Speller checks
- Structure Checks
- Data check

– Value Checks

Data Profiling provides hard instances of inaccurate data and is a pro-active approach to detecting data quality issues rather than a reactionary approach where in issues are detected after data is released to users for reporting.
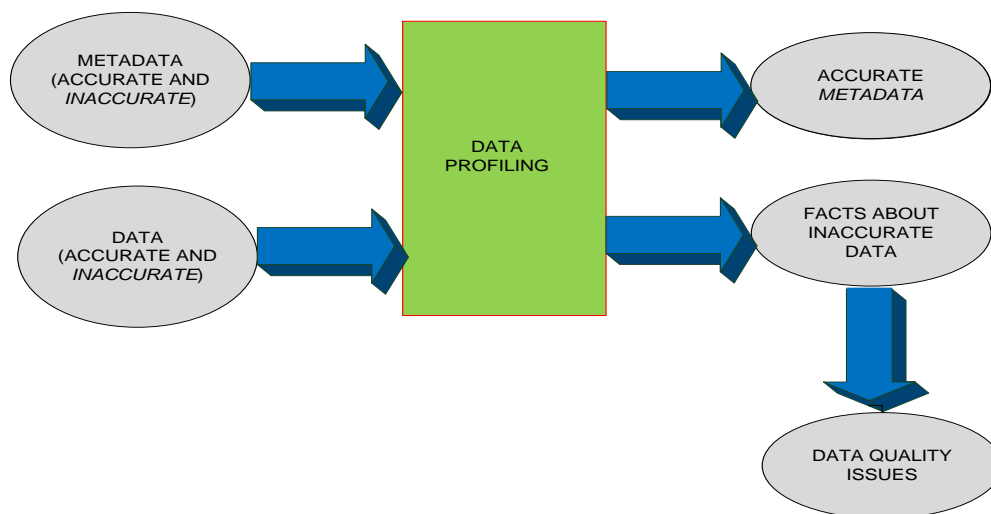

Figure 11 – The data profiling process

The data profiling process will generate accurate metadata as an output of the process by relying on the data for reverse engineering the metadata and comparing it to the proposed metadata.

Data profiling tasks need to be repeated on critical data stores such as claims data over time to ensure that the information continues to be accurate.

Onpoint is currently performing data quality checks for claims data received from submitters in the state of Maine. These checks include preliminary checks to ensure structural validity, load threshold checks and data quality threshold checks. Once the files pass through all these tests, it is stored in an Oracle database and accumulated over time for release on a quarterly basis. At the time of release, an extract process pulls the data from the Oracle tables and creates a flat file that is transferred to MHDO via an FTP process.

MHDO has identified data quality issues in the flat files received from Onpoint which include missing values, incorrect data types and wrong data values. It is possible for the flat files to have these data issues not because of any issues with the data quality edits being performed at Onpoint but possibly due to code defects in the extraction processes that pull data from the Oracle database into flat files for distribution to MHDO, once all the quality edits have been performed. Given the possibility of this situation, it is essential that MHDO performs quality checks using the data profiling method on the flat files received from Onpoint to uncover these data issues prior to load.

MHDO also needs to consider performing some of the threshold checks in the data staging area to identify issues prior to load, in addition to the checks identified above. These threshold checks can be customized to suit MHDO's needs and need not be on the scale as the checks performed by Onpoint. For example, they can be performed on certain data elements identified as critical by the MHDO team and known to be an issue (such as the Product Code, SSN, DOB fields as an example).

The MHDO team can take advantage of the features available in SSIS to perform some of the data profiling tasks. Since the SSIS tool is being used currently at MHDO for ETL processing, the MHDO team has an existing SSIS knowledge base and the learning curve to adopt the data profiling features can be expected to be fairly short in comparison with learning a new tool.

8.3.2 ADOPT DIMENSIONAL DATA ARCHITECTURE

MHDO needs to adopt dimensional data warehouse architecture as recommended by industry expert Ralph Kimball. The dimensional data warehouse is based on the principles of dimensional modeling and consists of a series of star schemas and/or cubes. It is an industry leading practice which has been implemented at several organizations, including health care organizations. Implementing a dimensional data warehouse architecture will provide scalability, efficiency and extensibility and will provide the foundation for a robust analytical framework.

What is dimensional data warehouse? - The dimensional data warehouse provides the foundation for an analytical framework. The dimensional data warehouse consists of one or more data marts. Each data mart acts as a subject area within the data warehouse and consists of a Fact table and one or more Dimension tables. Examples of data marts would be Dental, Pharmacy and Medical Claims data marts. The Fact and dimension tables are also known as the star schema. A Fact table contains factual data such as the total number of paid claims, total number of drugs dispensed etc. The dimension tables contain reference or descriptive data elements such as Patient Name, Address, Age, Zip, Gender etc. Fact tables are linked to the dimension tables by links known as dimension keys. The current architecture at MHDO provides no linkage between claims data attributes.

The dimensions in the data warehouse can be shared across data marts. For example, a single Provider dimension table will contain all the data elements needed for a Provider and will be shared across all the data marts. Similarly, a Member dimension will contain all attributes of patients who have encounters with doctors or hospitals and have associated claims information. Shared dimensions are also known as "conformed dimensions" and implementation of conformed dimensions is a leading practice.

What is a start schema? - The star schema dimensional model can take advantage of the scalability of the relational database to store granular and detailed information. The bus driven architecture identifies and enforces the relationships between business process metrics (facts) and descriptive attributes (dimensions).
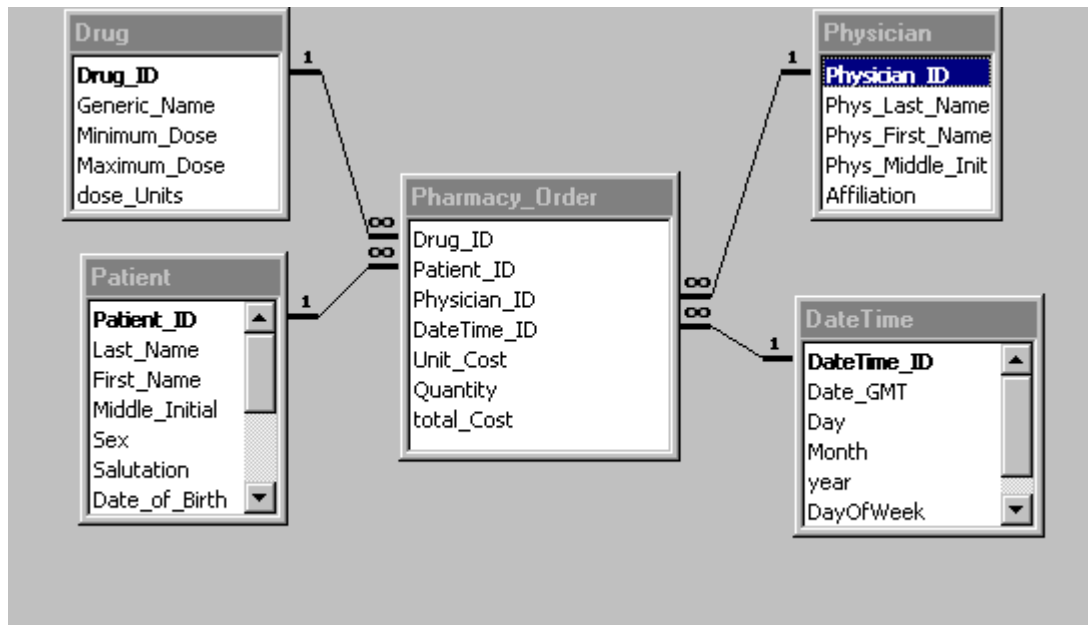
Figure 12 – Sample Star Schema Model

What is the bus architecture? - The data warehouse bus architecture is primarily an implementation of "the bus" of a collection of conformed dimensions, which are dimensions that are shared (in a specific way) between facts in two or more data marts. The integration of the data marts in the data warehouse is centered on the conformed dimensions (residing in "the bus") that define the possible integration "points" between data marts. Maintaining tight management over the data warehouse bus architecture is fundamental to maintaining the integrity of the data warehouse. The most important management task is making sure dimensions among data marts are consistent. If integration via the bus is achieved, the data warehouse, through its data marts, will not only be able to deliver the specific information that the individual data marts are designed to do, but can also deliver integrated data mart information, which, often, is of critical business value. Integration can be achieved in a flexible and iterative fashion.
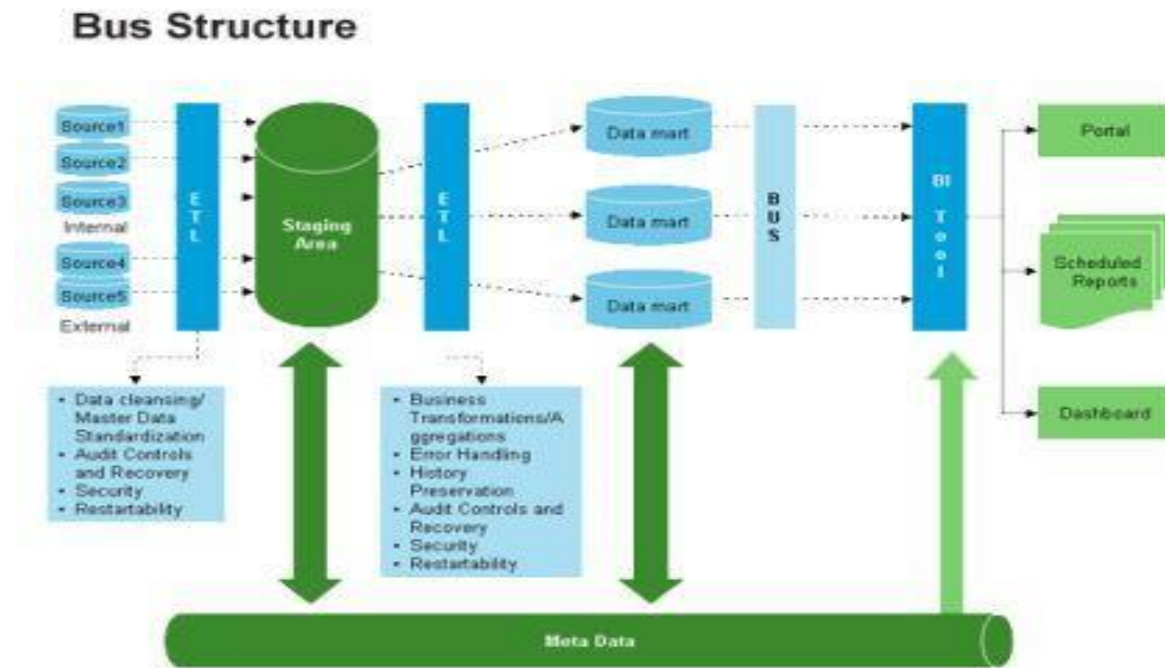

Figure 13– Representative bus structure

What is a cube? - Cubes are the main components in online analytic processing (OLAP), a technology that provides fast access to data in a data warehouse. A cube is a set of data that is constructed from the facts and dimensions (or a data mart/star schema) of a data warehouse and is organized and summarized into a multidimensional structure defined by a set of dimensions and measures. Measures in the context of a cube are synonymous with "facts" in a Fact table. The basic concept behind a cube is to pre-compute the various combinations of dimensions and facts so that they can be analyzed interactively.

A cube is fast and allows users to change their perspective on the data interactively by adding or removing attributes from their view and receiving the results instantly. Cubes allow users to drill up/down or slice and dice data and visualize data from different perspectives. Data in a cube can be accessed via a web based interface which is another major advantage of cubes. Cubes can be implemented using the SSIS tool using features such as the 'Cube wizard' with the Fact and Dimension tables of the star schema as the source.

One of the key benefits of the dimensional data warehouse architecture is that it is easy to add data marts or subject areas using a phased approach. The complexity involved in developing and maintaining the dimensional data warehouse architecture is not high in comparison with other architectures.

MHDO can adopt a phased approach to implement a dimensional data warehouse architecture supported by cubes. Since the volume of medical claims is the highest, followed by pharmacy and dental claims, one approach may be:

1) **PHASE 1**: Implement Medical Claims Data Mart which includes:

   - Medical Claims Star Schema (Fact and Dimension Tables)
   - Medical Claims Cube (Measures and Dimensions derived from Star Schema above)

2) **PHASE 2**: Implement Pharmacy Claims Data Mart which includes:

   - Pharmacy Claims Star Schema (Fact and Dimension Tables)
   - Pharmacy Claims Cube (Measures and Dimensions derived from Star Schema above)

3) **PHASE 3**: Implement Dental Claims Data Mart which includes:

   - Dental Claims Star Schema (Fact and Dimension Tables)
   - Dental Claims Cube (Measures and Dimensions derived from Star Schema above)

Medical claims comprises of Commercial, Medicare and Medicaid claims. Currently, the combined row count of all medical claims in the MHDO data base stands at over 200 million rows which are extremely large. An alternative approach would be to implement separate data marts for Commercial, Medicare and MaineCare claims. The advantage of this approach is that the volume is now divided over three separate data marts and the cubes would hold less data, increasing speed and efficiency of access. Creating separate data marts for commercial, Medicare and MaineCare claims also allows for customizing functionality based on the needs of the business for each of the cubes. For example, separate dimensions can be built into the Medicare cube based on Medicare products, Medicare coverage types etc.

This approach will provide benefits to users, who can benefit from high performance reporting capabilities provided by the cubes. Users can be provided access to the cubes as needed and can be granted access privileges upon request.

DATA STORAGE

Claims data stored in the dimensional data warehouse fact tables can be partitioned for increased efficiency. One effective partitioning strategy adopted at several organizations has been one based on dates. For example, yearly table partitions could be created for storing Medicare data. Any queries written to extract Medicare data for the year 2009, for example, would access the corresponding table partition created to house 2009 Medicare data and would hence result in faster access and quick response times.

Historical changes in descriptive dimensional data elements can be stored using special techniques known as SCD's or slowly changing dimension techniques. For example, when a Provider has a change in address, it is possible to store both the old and new address information in the same Provider dimension table using the slowly changing dimension techniques. There are various types of slowly changing dimension techniques (such as type 1, type 2, type 3, hybrid etc) that can be implemented and a detailed description of these techniques is beyond the scope of this discussion.

HISTORICAL CLAIMS DATA CONVERSION:

Once MHDO has implemented the dimensional architecture discussed above, they would be ready to receive claims data from Onpoint and store data from that point onwards in the data warehouse. MHDO would also need to have a strategy for moving historical claims data into the data warehouse repository One way to do this would be to use the current tables housing claims data information in the SQL

SERVER DBMS as the source system and use ETL logic with the SSIS tool to transfer data into the dimensional data warehouse.

8.4   OUR RECOMMENDATIONS – PEOPLE

Based on our understanding of MHDO organization and extrapolating them with the best practices followed in similar organizations, we recommend a few changes to the organization structure. The goals of these changes are to help MHDO develop and support all the capabilities of an Enterprise Data Warehouse organization so as meet the needs of its stakeholders, develop and implement project management and data management processes to make the outcomes predictable and implement knowledge management processes across the team to reduce people dependencies.

An organization like MHDO should consists of, at a high level, two groups. The first group is who understands the business functions, drivers and stakeholder expectations. They interact with customers and stakeholders to determine the business needs and are identified as Business group. This group should decide "what" needs to happen in MHDO. The second group should consist of persons who are technical experts and who decided "how" the business needs will be met, this group is currently staffed by persons from OIT. This group is identified as Technical group. A very important component for success of the above mentioned model is to have continuous interaction and engagement between these two groups. To manage these two groups and implement the processes recommended in section 8.1 and lead the effort to implement technical recommendations mentioned in section 8.2 there should be a full time Project Manager. The Project Manager should understands the business needs of MHDO and takes the direction from executive director on "what" needs to happen and directs the team as per the established methodologies and policies of MHDO and OIT, on a day-to-day basis.

Project Manager - The roles and responsibilities for the new position of PM will include

- Leading the overall execution of the projects.
- Leading the collection, organization and documentation of business needs for the changes requested for projects. This may be done through agreed upon SDLC methodology and tools that support the methodology.
- Support the overall documentation of entire system and business processes.
- Direct the team to follow the structured methodology to meet the business needs.
- Provide estimates to implement the changes, which help leadership in making decisions and prioritizing the changes
- Support defect correction, ad-hoc changes and minor development
- Plan and support system oriented tasks (for example data transformation for Medicaid and Medicare data, receipt of data from Onpoint, DBA tasks etc)
- System management that includes source code management, software licensing, technology upgrades, back up, recovery and business continuity planning

As we mentioned in section 7.3 there are other several key roles missing from MHDO organization. These roles are QA analyst, Business Analyst and DBA.

QA Analyst – The roles and responsibilities of QA analyst are as follows

- Plan, schedule, coordinate, and implement automation testing cycles.
- Maintain and update test databases.
- Work with development to design new test cases.
- Automate and test software programs, including test case design and execution of functional, regression tests.
- Update and install new releases of testing tools used by the QA automation group and keep aware of new developments.
- Write and distribute reports to describe automation program evaluation problems found, corrections needed, and problem areas.

- Track overall test coverage for application.
- Log any issues/defects encountered during test cycles and conduct fix verification.
- Identify, create and maintain automated Functional and GUI based tests.
- Update and install new releases of testing tools used by the QA group and keep aware of new developments.
- Write and distribute reports to describe program evaluation problems found, corrections needed, and problem areas.

Business Analyst – The roles and responsibilities for business analyst are as follows

- Assesses current systems and understands the business processes
- Develops and maintains documents related to business requirements
- Addresses gaps between end users and technical team from a functional perspective and maintains communication of requirements
- Designs business transactions such as the interface agreement
- Documents and analyzes business processes using tools as appropriate
- Documents functional requirements for use by application designers and developers
- Is an active participant in unit testing, system testing, and regression testing
- Establishes clear communication channels for business and functional requirements

DBA – The roles and responsibilities of DBA are as follows

- Creates and maintains all databases required for development, testing, education and production usage.
- Performs the capacity planning required to create and maintain the databases. The DBA works closely with system administration staff because computers often have applications or tools on them in addition to the RDBMS Databases.
- Performs ongoing tuning of the database instances.
- Install new versions of the RDBMS and its tools and any other tools that access the RDBMS database.
- Plans and implements backup and recovery of the RDBMS database.
- Controls migrations of programs, database changes, reference data changes and menu changes through the development life cycle.
- Implements and enforces security for all of the RDBMS Databases.
- Performs database re-organizations as required to assist performance and ensure maximum uptime of the database.
- Puts standards in place to ensure that all application design and code is produced with proper integrity, security and performance. The DBA will perform reviews on the design and code frequently to ensure the site standards are being adhered to.
- Evaluates releases of RDBMS and its tools, and third party products to ensure that the site is running the products that are most appropriate.
- Planning is also performed by the DBA, along with the application developers and System administrators, to ensure that any new product usage or release
- Upgrade takes place with minimal impact.
- Provides technical support to application development teams. This is usually in the form of a help desk. The DBA is usually the point of contact for RDBMS Corporation.
- Enforces and maintains database constraints to ensure integrity of the database.
- Administers all database objects, including tables, clusters, indexes, views, sequences, packages and procedures.
- Assists with impact analysis of any changes made to the database objects.
- Troubleshoots with problems regarding the databases, applications and development tools.
- Create new database users as required.

- Manage sharing of resources amongst applications.
- The DBA has ultimate responsibility for the physical database design.

The executive director of MHDO should have the overall responsibility of program in setting the direction and priorities and should continue to report to the board of directors. The executive director of MHDO may take inputs from OIT leadership and Onpoint leaders in making decisions, as per the governance structure described in the section 8.1.1

Key considerations of the model defined below are to establish clear lines of accountability for day-to-day activities. We recommend that this either be implemented through assignment of an existing resource to the Project Manager role or hire a new person to perform this role. This organization chart is used to depict day-to-day work lines of authority and is not intended to reflect the Human Resource (HR) model that used to manage personnel related topics (performance reviews, compensation, etc). A clear memorandum of understanding (MOU) is likely the best way for MHDO and OIT to establish consistency of management across the work lines of authority and the HR related management.

A similar model was used by the MIHMS Project Manager and OIT to facilitate incorporation of a Shared Services model that tapped into OIT team members as appropriate throughout that project.
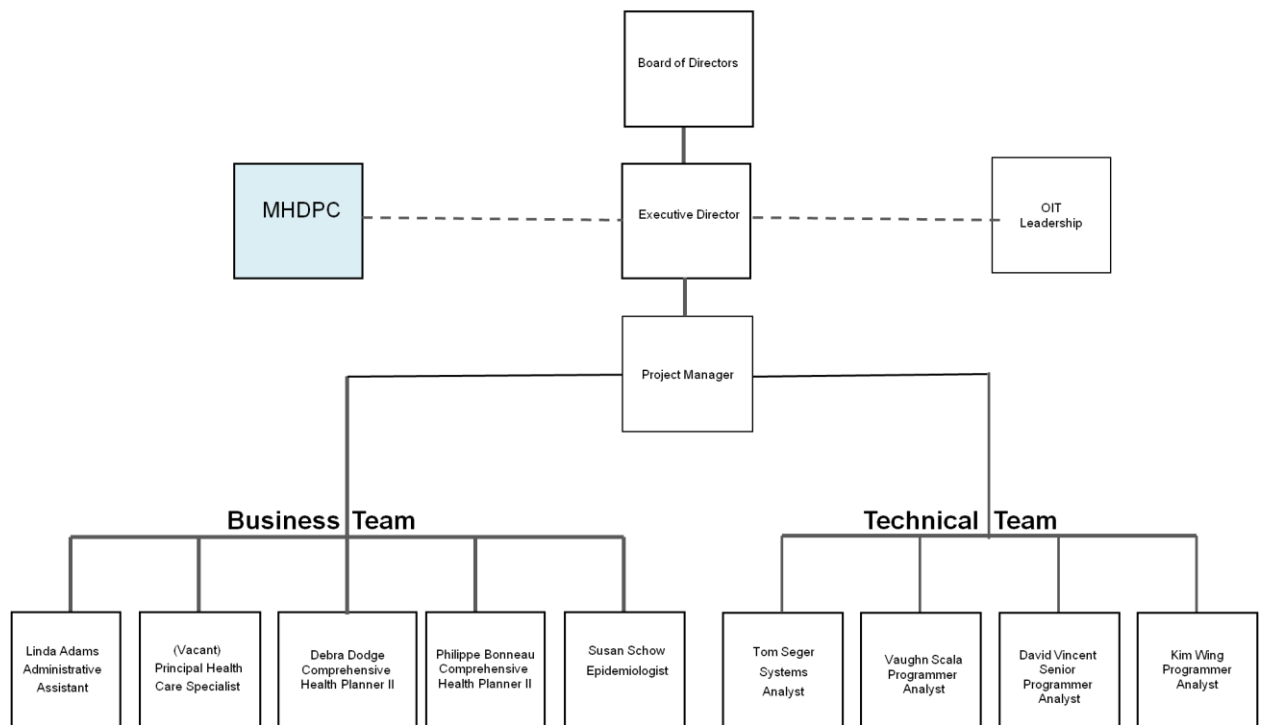

Figure 14 – The future MHDO organization structure

The advantages of using this model are:

1. Unified structure, with single lines of accountability for individuals. This should result in clear direction for Project Manger and rest of the team.
2. Project Manager will be providing day-to-day direction to entire team
3. Project Manger will lead the team in implementing the processes described in section 8.1
4. Project Manager will lead the team in implementing technical enhancements described in section 8.2
5. The business and technical teams will have clearly defined roles

6. The knowledge management across MHDO team will be enhanced due to involvement of both business and technical resources in any project, resulting in reduced risk for MHDO organization
7. OIT will continue to support infrastructure, security and desktop support

The disadvantage of using this model is:

1. It may be a little challenging to find a Project Manager who can lead both business and technical teams.

8.4.1 SUMMARY

We have suggested several new roles that are needed in MHDO organization. However, it is important to note that it is not required to have a new person for each of these roles. Persons from existing staff may perform the roles of a QA analyst or business analyst or DBA, as long as responsibilities are clearly identified and expectations are set accordingly.

For the success of this structure, it is critical that leadership of MHDO, Onpoint and OIT work closely to set the direction and priorities for all the teams. There should be planned and regular interactions, as suggested in section 8.1.2.5, among the leadership of MHDO, Onpoint and OIT.

9   ROADMAP

In sections 8, we have identified a series of recommendations across process, technology and people threads. These recommendations need to be implemented with minimal or no impact to day-to-day business and based on logical dependency on each other. The graphic below mentions the high level roadmap.

Figure 16 – High level roadmap for MHDO

The list of recommendations include both short and long term activities, which will provide MHDO clear and measurable results and address stakeholders concerns.

The first step is to enhance the overall governance structure to create a leadership group (or steering committee) that provides guidance to all the MHDO teams. In parallel to this a project manager should be assigned as identified in section 8.3. This is a key role for the successful of implementation of all the changes recommended. Once the project manager is assigned, project management processes should be established by team lead. In parallel to project manager assignment, the roles of BA, QA and DBA should be assigned. These roles may be assigned to existing team members. Once these roles are assigned, implementation of interface agreement may be started as it will be driven by business analyst(s) and project manager. By the end of first 3 months, most of the process and people related recommendations should either be implemented or close to being implemented. This is the first step of overall change. These changes will help stabilize the current operational challenges with the goal to meet current expectations of stakeholders.

The next step is to start the implementation of technology recommendations. The implementation of these will use the processes established so far. At this time data governance and data profiling activities may be

started. These activities are necessary to reduce the current delays in the processing of data. MHDO will need to make an assessment of currently available skill set within the organization to implement data governance and data profiling activities. MHDO may have to make investment in acquiring the right skills to implement these recommendations.

The last step is of re-building of data architecture, which is a long initiative. As discussed in section 8.2.2 this should be done in multiple phases. These changes will make MHDO flexible and nimble resulting in improved performance in terms of accuracy and turnaround time. In addition it will also prepare MHDO to be ready to meet the demands of Health Reform.