



National Information Exchange Model

Human Services Domain
Data Harmonization Process

February 11, 2013

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1 Introduction

The National Information Exchange Model (NIEM) Human Services Domain Data Harmonization Process is a way to help identify the commonalities and differences in source data which are used to define a set of reusable data that support the development of information exchanges. Using shared data that are defined and described in a standard way provides a method to meet the business needs of a community sharing data. Having a repeatable process that helps identify data elements that are in use in other communities within the NIEM environment reduces duplication, increases reusability, increases consistency, reduces ambiguity, and improves data quality in a wider universe.

This document explains the harmonization process developed to support the definition and description of candidate content for the NIEM Human Services Domain Reference Data Model. The NIEM Human Services Domain Reference Data Model is an eXtensible Markup Language (XML) Schema that is intended to be the authoritative definition schema for information exchange and data sharing within the Human Services Community of Interest (COI). The NIEM Human Services Domain Reference Data Model is the foundation upon which Human Services Domain Information Exchange Package Documentation (IEPD) specifications should be built.

Note that the NIEM Human Services Domain Data Harmonization Process does not target persistent data (data within databases, or other “at rest” repositories). The process is intended for use in harmonizing data that is to be exchanged, or shared via one or more Information Exchanges.

1.1 Background

The NIEM Human Services Domain was officially established by the Department of Health and Human Services (HHS) and recognized by the NIEM Executive Steering Council (ESC) in March 2012 to support information sharing and promote interoperability between and beyond Human Services organizations and federal, state, local, and tribal agencies.

Data used within various contexts and programs (source data elements) may have some characteristics that are similar. Examples of characteristics are structure (type, length) and meaning (semantics). Once identified, these characteristics are used to determine the level of harmonization among the source data elements. The process determines if data from various sources are identical, similar, or distinct.

While all source data may be harmonized and a disposition (identical, similar, or distinct) determined; all harmonized data elements may not be suitable for use within the NIEM Human Services Domain Reference Data Model, as a standard commonly used data element. The objective of harmonization is to provide a list of candidate data elements that are in common use, determine if they are used across multiple information exchanges and present those data elements as candidates for the NIEM Human Services Domain Reference Data Model.

1.2 Scope

The objective of this document is to describe the process for identifying candidate data elements for inclusion in the NIEM Human Services Domain Reference Data Model. The NIEM Human Services Domain Reference Data Model and other NIEM Domain Reference Data Models are intended to provide content upon which to build exchanges. These Reference Data Models are evolving representations of the data that support information exchange and interoperability; therefore, there is a need to be able to extend and add content to the models. This document supports that need and identifies activities designed to facilitate “Data Model Maintenance” and provides the basis for “Cross-Domain Coordination” in alignment with the NIEM Human Services Domain Operations and Maintenance (O&M) Plan.

For the purpose of this document, a Glossary of Terms section is provided.

1.3 Audience

This document targets technical and non-technical stakeholders who employ NIEM for information exchange and interoperability, or have a need to understand the NIEM Human Services Domain data harmonization process.

1.4 References

The following reference items provide useful background when applying the harmonization process.

Reference Item	Location
NIEM High-Level Version Architecture, Version 1.0	https://www.niem.gov/documentsdb/Documents/Technical/NIEM_HLVA.pdf
NIEM Naming and Design Rules, Version 1.3	https://www.niem.gov/documentsdb/Documents/Technical/NIEM-NDR-1-3.pdf
NIEM Model Package Specification, Version 1.0	http://reference.niem.gov/niem/specification/model-package-description/1.1/model-package-description-1.1.pdf
NIEM Domain Update Specification, Version 1.0	http://reference.niem.gov/niem/specification/domain-update/1.0/domain-update-1.0.pdf
NIEM-UML Profile Specification, Version 1.0	http://www.omg.org/spec/NIEM-UML/1.0/
ACF Interoperability Initiative Web Site	http://www.acf.hhs.gov/initiatives-priorities/interoperability

Table 1 Reference Items

1.5 Tools

The following tools are required in order to apply the harmonization process:

- Source Data Set(s)
- Spreadsheet Templates, Checklists, Review Criteria, and Guidance Document(s)
- Issue and Requirements Management and Tracking
- Human Services Meta-Data Repository
- NIEM Core and Domain Reference Models
- Interoperability Initiative Document Repository
- NIEM.gov Human Services Domain Community web site
- National Human Services Interoperability Architecture (NHSIA) View

1.6 Capabilities

Applying the harmonization process requires a set of skills. The skills include:

- Knowledge of NIEM
- Knowledge of NHSIA
- Understanding of metadata
- Subject matter expertise in the data being harmonized

2 Data Harmonization Process

Data Harmonization is a set of actions or operations – applied to a collection of data sources to help determine the commonalities and differences amongst the data. Once these commonalities and differences are exposed, it is possible to determine if source data elements are identical, similar, or distinct. The determination provides candidates for standardization – candidate inclusion in NIEM.

The NIEM Human Services Data Harmonization Process may be executed in varying configurations:

- Harmonization of data amongst constituents in the Human Service COI
- Harmonization of data between the Human Services COI and the Human Services NIEM Domain
- Harmonization of data between the Human Services COI and external standards

The NIEM Human Services Domain Data Harmonization Process (Figure 1) is comprised of three phases - **Planning**, **Analysis**, and **Closure**. The following sections describe the process in detail, identify tasks, and deliverables. ***Please note that the NIEM Human Services Domain Data Harmonization Process references several artifacts (templates, review criteria, and guidance documentation) that have not been developed. These artifacts shall be developed and made available in a later version of this document.***

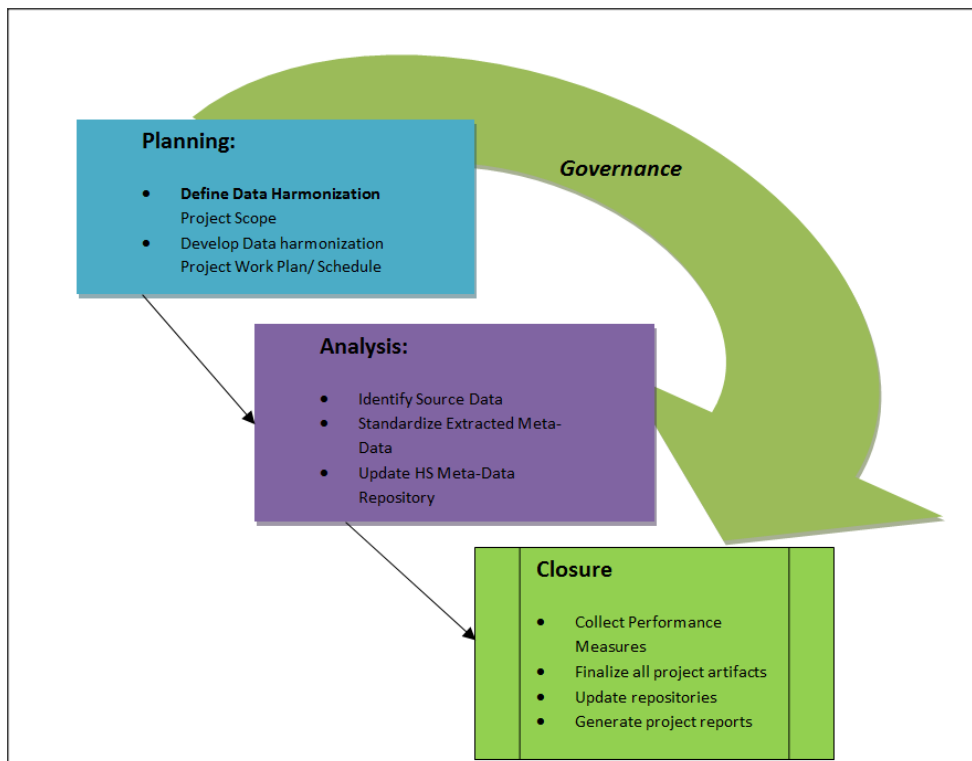


Figure 1 NIEM Human Services Domain Data Harmonization Process

2.1 Planning

The data harmonization activities must be focused on a specific set of data or scope that is intended to support information exchange, or data sharing. Based upon a targeted set of business activities or capabilities, the set of data or scope is determined and agreed upon during the Planning phase (Figure 2), and refined during the Analysis phase (Figure 4).

Management of the harmonization activities can be facilitated through an understanding of the depth and breadth of the set of exchange data, at varying levels of granularity. During Planning, breadth is a set of business activities, or capabilities supported by data exchanges; and depth is the level at which data exchange will be analyzed, e.g. inter-agency data exchanges vs. intra-agency data exchanges. During Analysis, breadth is determined based upon the actual number of individual data elements, and depth is represented by their characteristics such as type, length, name, semantics, etc.

Note: A summary of all tasks, deliverables, and roles can be found in appendix A, and appendix B.

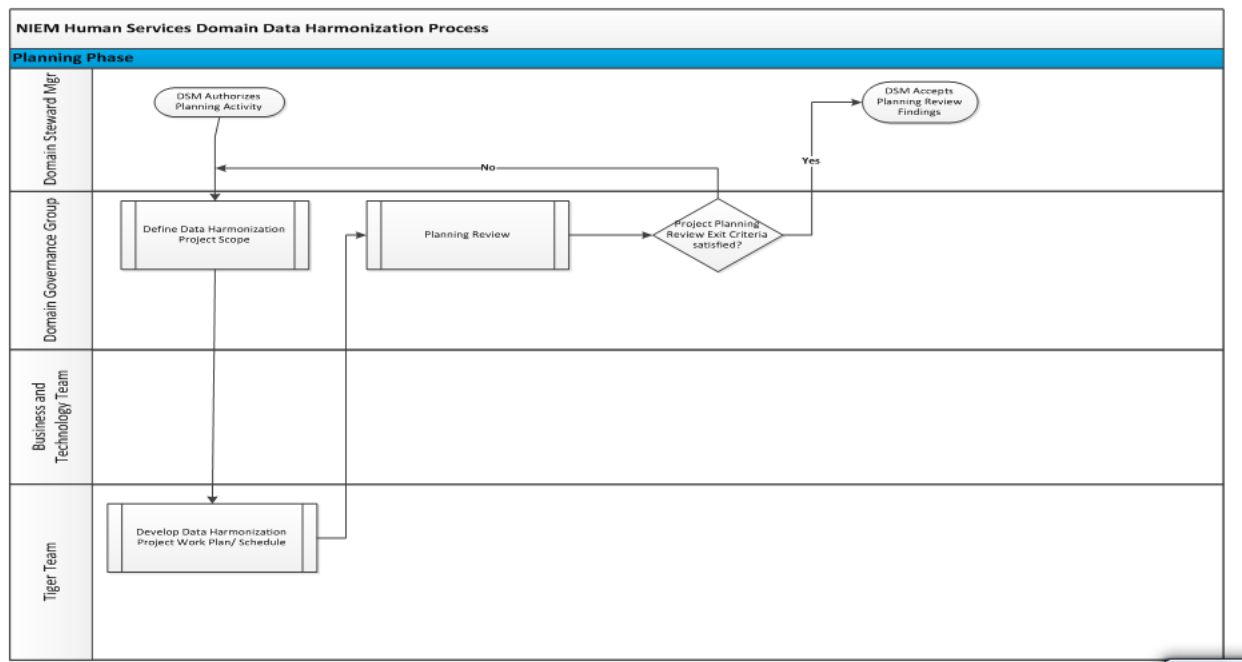


Figure 2 Planning Phase Process Model

2.1.1 Define Data Harmonization Project Scope

Utilizing Human Services Domain community needs, issues, requirements, and other appropriate mechanisms, the project breadth and depth is determined for a harmonization effort. This determination may be in the context of the NHSIA (Figure 3), in support of Interoperability and Information sharing requirements aimed at achieving improved outcomes for Human Services recipients.

NHSIA offers a foundation for common understanding, interoperability, standards, and reuse. Objectives include establishing a common vocabulary, providing a business and technical framework, promoting sharing and reuse, encouraging data exchange standards development, developing standard data structures, and improving operational efficiency and effectiveness. Within the NHSIA Information Viewpoint, NIEM is the identified standard for developing Information Exchanges. Additionally, the NHSIA provides mappings, between NHSIA artifacts, that may assist in scope determination.

Once the project breadth and depth have been identified, they are documented in the Project Scope Specification.

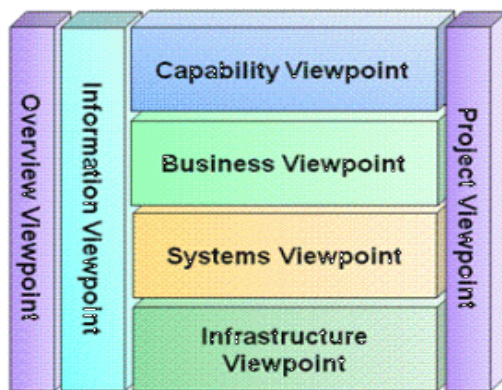


Figure 3 National Human Services Interoperability Architecture (NHSIA)

Input(s) Project Scope Specification Template
 Human Services Community Need(s)
 Human Services Domain NIEM Issue & Requirements Management & Tracking Tool

Deliverable(s) Project Scope Specification

2.1.2 Develop Data Harmonization Project Work Plan/Schedule

Utilizing the guidelines set forth in this document, a project work plan/schedule is developed, identifying the tasks and deliverables required to complete the scope of data harmonization activities. The data harmonization process produces candidate data elements for inclusion in the NIEM Human Services Domain Reference Models, and should be scheduled in alignment with the NIEM Human Services Domain Governance Group activities of reviewing the NIEM Human Services Domain Reference Model and recommending new content.

Input(s) Project Work Plan/ Schedule Template
 Project Scope Specification

Deliverable(s) Project Work Plan/ Schedule

2.1.3 Planning Review

The NIEM Human Services Governance Group is consulted at the end of the Planning phase to provide a combination of programmatic, policy, business, and technical expertise in approving the establishment of the project's scope and direction. At a minimum, the NIEM Human Services Governance Group must ensure that harmonization efforts are aligned and traceable to Human Services Domain requirements; all project governance tasks are identified; all project applicable issues are accounted for in the project work plan, documented, and communicated; and all project risks are identified, and documented along with a mitigation plan. The intent of this task is to ensure that the harmonization efforts continue to be aligned to governance direction and that all planning deliverables satisfy Project Planning Review Exit Criteria.

Input(s) Project Scope Specification
 Project Work Plan/ Schedule Template
 Project Planning Review Exit Criteria

Deliverable(s) Project Planning Review Findings

2.2 Analysis

The data harmonization activities in this phase will require the review and analysis of large volumes of collected information. In order to produce repeatable high-quality results (common data elements that promote reuse across information exchanges), it is critical that the Analysis phase (Figure 4) activities are conducted in a pragmatic, process-oriented fashion. During the Analysis phase, the data harmonization breadth and depth are refined, providing an opportunity to fine-tune the harmonization effort scope; and harmonization is conducted in various configurations.

Prior to a final analysis review, the project will consult the Administration for Children and Families (ACF) Interoperability Initiative sub-group to provide collaboration with the Centers for Medicaid and Medicare Services (CMS) and the Center for Consumer Information and Insurance Oversight (CCIIO). This sub-group is tasked to ensure coordination and consistency with work being performed by CCIIO as that agency is in the process of building its own initial offering into NIEM: the NIEM Health Services Domain. Coordination between CCIIO and ACF is critical to expediting both agency NIEM efforts. Doing so will reduce duplication of effort, enhance information sharing and cross-pollination of research, and improve the applicability work products.

Note: A summary of all tasks, deliverables, and roles can be found in appendix A and appendix B.

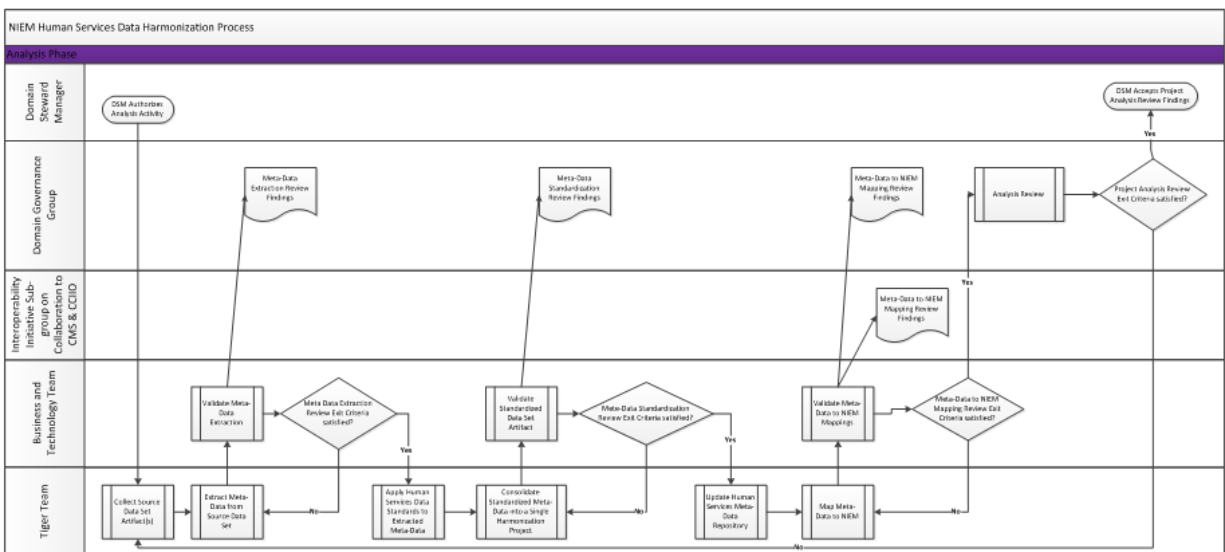


Figure 4 Analysis Phase Process Model

2.2.1 Identify Source Data

The first step in the Analysis phase is to identify the actual source data artifacts, based upon the specified scope. Source data may be in various formats and contexts to include paper forms, databases, and current or new data exchanges. The collected artifacts represent the “source data set” that will be the subject of meta-data extraction and later harmonization activities.

2.2.1.1 Collect Source Data Set Artifact(s)

Gather all supporting documentation for the source data set(s) such as data dictionaries, business glossaries, data models, forms, system interface specifications, instructions, and business process models and work flows. This may include, but is not limited to, documented data standards, NIEM information exchanges, non-NIEM information exchanges, etc. These reference documents should be stored and categorized into a Source Data Set Inventory Repository.

Input(s) Source Data Set Artifact(s) – Forms, Information Exchanges, Standards, etc.

Deliverable(s) Source Data Set Inventory Repository

2.2.1.2 Extract Meta-Data from Source Data Set

Review the source data set, extract meta-data and populate the Meta-Data Extraction Form. During this process, close attention is paid to all relationships that exist between and among meta-data, as this information may be essential later in the harmonization process. These relationships may be documented in the comments. The Meta-Data Extraction Form is a spreadsheet designed to aid in the identification of characteristics of the source data set artifacts required to facilitate harmonization. The form provides instruction for its completion. Creating a form per source data set artifact will aid in traceability of extracted meta-data and facilitate management and execution of validation activities that follow.

Input(s) Source Data Set Inventory Repository
Meta-Data Extraction Form Template

Deliverable(s) Meta-Data Extraction Form(s)

2.2.1.3 Validate Meta-Data Extraction

Verify that the extracted meta-data match the Source Data Set Inventory Repository. This Task should be done by someone other than who performed the original meta-data extraction. The intent of this task is to develop consensus that the meta-data extraction satisfies Meta-Data Extraction Review Exit Criteria, documented in the appendix.

Input(s) Meta-Data Extraction Form(s)
Meta-Data Extraction Form Template

Deliverable(s) Meta-Data Extraction Review Findings

2.2.2 Standardize Meta-Data

Harmonization requires thorough understanding of meta-data characteristics to facilitate the identification of identical, similar, or distinct data elements. Standardization facilitates this understanding.

2.2.2.1 Apply Human Services Data Standards to Extracted Meta-Data

This task applies the Human Services Domain data standards to the characteristics of the extracted Meta-Data to facilitate improved understanding of the data, and improved quality of the harmonization results. Standardization shall include, but not be limited to data definitions and data names. The *NIEM Human Services Domain Data Naming and Definition Standards Guide* provides instruction on how to apply the Human Services standard.

Input(s) Meta-Data Extraction Form(s)
NIEM Human Services Domain Data Naming Definition Standards Guide

Deliverable(s) Meta-Data Extraction Form(s) – Updated based upon standards

2.2.2.2 Consolidate Standardized Meta-Data into a Single Harmonization Project

Review the meta-data extraction forms to identify identical, similar, and/or distinct meta-data. The result is a consistent set of standard, comprehensive data elements documented on the Meta-Data Harmonization Form. The *Meta-Data Harmonization Checklist* provides guidance on how to apply the levels of harmonization (identical, similar, or distinct). The intent is to be able to trace all harmonization results to guidance that produces repeatable results.

Input(s) Meta-Data Harmonization Checklist
Meta-Data Harmonization Form Template

Deliverable(s) Meta-Data Harmonization Form

2.2.2.3 Validate Standardized Data Set Artifact

Verify that the meta-data harmonization form adheres to NIEM Human Services Domain Data Naming and Definition Standards, and that any deviations are documented to the satisfaction of the reviewing committee. To ensure that an unbiased review is performed, this task should not be completed by the individual(s) that perform the standardization. The intent of this task is to develop consensus that the data standardization satisfies Meta-Data Standardization Review Exit Criteria.

Input(s) Meta-Data Harmonization Form
Meta-Data Harmonization Form Template

Deliverable(s) Meta-Data Standardization Review Findings

2.2.3 Update Human Services Meta-Data Repository

The Human Services Meta-Data Repository houses the agreed upon harmonized data element specifications that are used in support of information exchange for Human Services Domain COI. Since multiple harmonization efforts can occur at the same time the Human Services Meta-Data Repository is the integration point for all of the Human Services COI harmonization efforts. The Human Services Meta-Data Repository also represents the Conceptual Data Model (CDM) artifact that is identified within the NHSIA Information Viewpoint.

Input(s) Meta-Data Harmonization Form

Deliverable(s) Meta-Data Repository (Initialized/ Updated)

2.2.4 Identify Candidate NIEM Human Services Domain Data Elements

A Candidate NIEM Human Services Domain data element is an opportunity to improve the NIEM Human Services Domain Reference Data Model (XML Schema). This XML Schema is intended to be an authoritative definition schema for Information Exchange and Data Sharing within the Human Services Community of Interest (COI). The candidate may take the form of a Human Services COI Data Element specification that does not currently exist in NIEM or the candidate may exist in NIEM and need changes to satisfy the specific needs of the Human Services COI. The intent of this task is to identify candidate data elements to be considered for inclusion in the NIEM HS Domain data elements.

2.2.4.1 Map Meta-Data to NIEM

Review the “new” meta-data elements that were migrated into the Human Services Meta-Data Repository to identify similar data elements within NIEM, to which they may align. This will involve an inspection of name, meaning, context, structure, content, etc. Once similarities have been identified and analyzed, it may be said that the subject elements can be mapped together. In which case, the subject data element is already represented in NIEM. In some cases there may be no mapping, indicating that a potential new data element has been identified. The intent of this task is to discover potential new data elements or new content for NIEM.

Input(s) Meta-Data Repository (Initialized/ Updated)
Meta-Data to NIEM Mapping Template

Deliverable(s) Meta-Data to NIEM Mapping(s)

2.2.4.2 Validate Meta-Data to NIEM Mappings

Review the Meta-Data to NIEM Mapping deliverable to ensure that all mapping/ harmonization decisions are consistent with the *Meta-Data Harmonization Checklist*, and that meaning is maintained. The intent of this task is to develop consensus that the migrated meta-data to NIEM mapping satisfies Meta-Data to NIEM Mapping Review Exit Criteria.

Input(s) Meta-Data to NIEM Mapping(s)
 Meta-Data to NIEM Mapping Review Exit Criteria

Deliverable(s) Meta-Data to NIEM Mapping Review Findings

2.2.5 Analysis Review

The NIEM Human Services Governance Group is consulted at the end of the Analysis phase to provide a combination of programmatic, policy, business, and technical expertise in approving candidate harmonization process work products. The intent of this task is to ensure that the harmonization analysis efforts and work products satisfy Project Analysis Review Exit Criteria.

Input(s) Source Data Set Inventory Repository
 Meta-Data Extraction Form(s)
 Meta-Data Extraction Review Findings
 Meta-Data Extraction Form(s) – Updated
 Meta-Data Harmonization Form
 Meta-Data Standardization Review Findings
 Meta-Data Repository (Initialized/ Updated)
 Meta-Data to NIEM Mapping(s)
 Meta-Data to NIEM Mapping Review Findings
 Project Analysis Review Exit Criteria

Deliverable(s) Project Analysis Review Findings

2.3 Closure

Once the data harmonization activities have been completed and vetted by the NIEM Human Services Domain Governance group, the Closure phase (Figure 5) ensure that all final project deliverables are collected and uploaded to the Interoperability Initiative document repository and/or the NIEM.gov Human Services Domain community web site as appropriate. Additionally, all applicable reports and performance measures are generated and/or collected.

Note: A summary of all tasks, deliverables, and roles can be found in appendix A and appendix B.

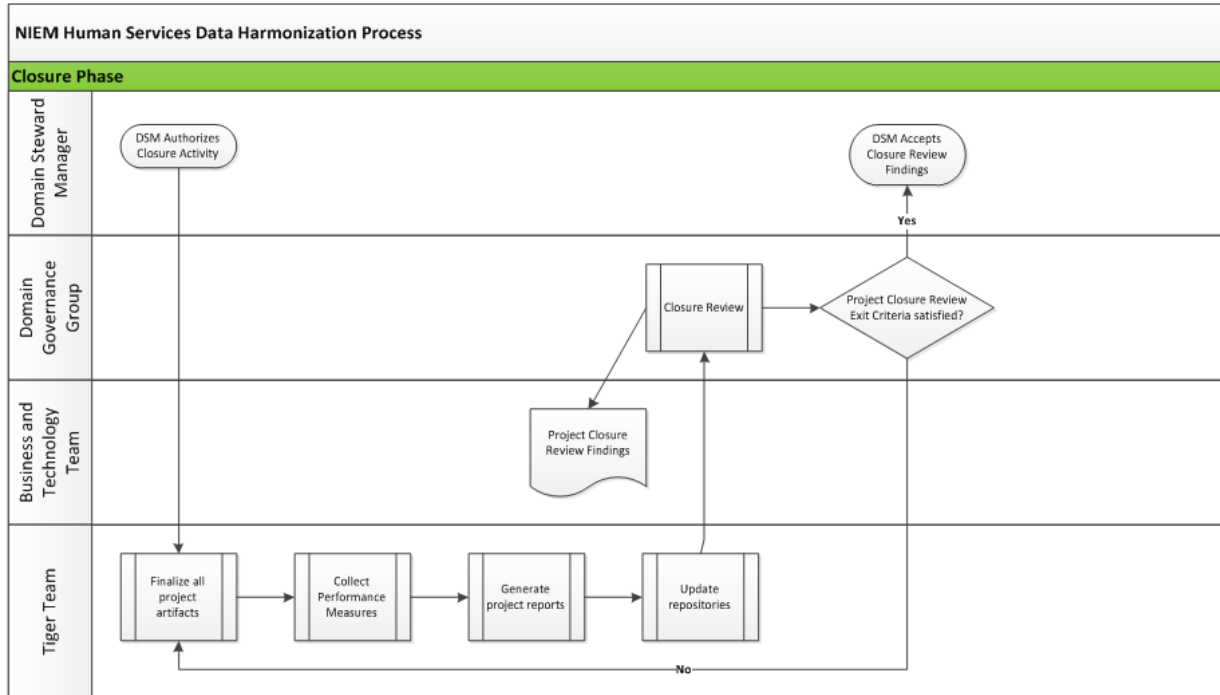


Figure 5 Closure Phase Process Model

2.3.1 Finalize all Project Artifacts

Ensure that all feedback from the project milestone reviews have been adjudicated and resolved for each and every project deliverable, and that an updated/final version of each deliverable is available.

Input(s)	Source Data Set Inventory Repository Meta-Data Extraction Form(s) Meta-Data Extraction Review Findings Meta-Data Extraction Form(s) – Updated Meta-Data Harmonization Form Meta-Data Standardization Review Findings Meta-Data Repository (Initialized/Updated) Meta-Data to NIEM Mapping(s) Meta-Data to NIEM Mapping Review Findings Project Analysis Review Findings
Deliverable(s)	Source Data Set Inventory Repository (Final) Meta-Data Extraction Form(s) (Final) Meta-Data Extraction Review Findings (Final) Meta-Data Extraction Form(s) – Updated (Final) Meta-Data Harmonization Form (Final) Meta-Data Standardization Review Findings (Final) Meta-Data Repository (Initialized/Updated) (Final) Meta-Data to NIEM Mapping(s) (Final) Meta-Data to NIEM Mapping Review Findings (Final) Project Analysis Review Findings (Final)

2.3.2 Collect Performance Measures

Review final versions of the deliverables and project notes to collect any required performance measures, per the Performance Measure Report Template.

Input(s)	Performance Measure Report Template
Deliverable(s)	Performance Measure Report

2.3.3 Generate Project Reports

Review final versions of the deliverables and project notes to collect any potential lessons that might improve the execution of later data harmonization efforts.

Input(s)	Lessons learned Template
Deliverable(s)	Lessons Learned Report

2.3.4 Update Repositories

Upload final versions of the deliverables to their appropriate repository.

Input(s)	Source Data Set Inventory Repository (Final) Meta-Data Extraction Form(s) (Final) Meta-Data Extraction Review Findings (Final) Meta-Data Extraction Form(s) – Updated (Final) Meta-Data Harmonization Form (Final) Meta-Data Standardization Review Findings (Final) Meta-Data Repository (Initialized/Updated) (Final) Meta-Data to NIEM Mapping(s) (Final) Meta-Data to NIEM Mapping Review Findings (Final) Project Analysis Review Findings (Final) Performance Measure Report Lessons learned Report
Deliverable(s)	Issue and Requirements Management and Tracking (Updated) Interoperability Initiative Document Repository (Updated) NIEM.gov Human Services Domain Community web site (Updated)

2.3.5 Closure Review

The NIEM Human Services Governance Group is consulted at the end of the Closure phase to provide a combination of programmatic, policy, business, and technical expertise in approving the close out of a project. At a minimum that the NIEM Human Services Governance Group must account for all project artifacts; ensure that appropriate stakeholders have been informed of project results; and identify lessons learned that might impact governance of the domain. The intent of this task is to ensure that the harmonization project closure efforts and work products satisfy Project Closure Review Exit Criteria.

Input(s)	Issue and Requirements Management and Tracking (Updated) Interoperability Initiative Document Repository (Updated) NIEM.gov Human Services Domain Community web site (Updated) Project Closure Review Exit Criteria
Deliverable(s)	Closure Review Findings

3 Glossary of Terms

Characteristic	A distinguishing trait, quality, or property.
Data Element	A unit of data that is identified and defined by a specific set of characteristics.
Data Harmonization	A set of actions or operations – applied to a collection of disparate data sets and result in a consistent set of standard, agreed-upon, and comprehensive data elements that can be utilized and transmitted across, and between, the involved organizations. Additionally, the process may be applied in various contexts, e.g., a specific information exchange or across a community.
Data Model	An abstract model that describes how data are represented and accessed.
Distinct (Data Element)	Less than 65% of the characteristics are the same.
Domain	A group of data elements that have been harmonized.
Identical (Data Element)	100% characteristics are the same.
Information Exchange Package Documentation	Information Exchange Package Documentation (IEPD) is a NIEM Model Package Description (MPD) specification containing NIEM-conformant XML Schema that define(s) one or more recurring XML data exchange.
Information Exchange Model	One or more NIEM-conforming XML schemas that together specify the structure, semantics, and relationships of XML objects.
Interoperability	The ability of two or more systems or components to exchange information and to use the information that has been exchanged.
Meta-Data	Information about data that describes, explains, locates or otherwise makes it easier to retrieve, use or manage data.
Model Package Description	A Model Package Description is an organized set of files that contains one and only one of the five classes of Information Exchange Model (IEM), as well as supporting documentation and other artifacts.
Similar (Data Element)	65% to 99% of the characteristics are the same.
Source	A system, message exchange, document, or form from which a data element's definition is obtained.
XML	eXtensible Markup Language (XML) is a simple text-based format for representing structured information.
XML Schema	A way to describe and validate data in an XML environment.

4 Acronyms and Abbreviations

ACF	Administration for Children and Families
CCIO	Center for Consumer Information and Insurance Oversight
CDM	Conceptual Data Model
CMS	Centers for Medicaid and Medicare Services
COI	Community of Interest
DSM	Domain Steward Manager
E&E	Eligibility and Enrollment
HHS	Department of Health and Human Services
HLVA	High-Level Version Architecture
IEM	Information Exchange Model
IEPD	Information Exchange Package Documentation
MPD	Model Package Description
NHSIA	National Human Services Interoperability Architecture
NIEM	National Information Exchange Model
NIEM-NDR	National Information Exchange Model – Naming and Design Rules
O&M	Operations and Maintenance
RACI	Responsible, Accountable, Consulted, Informed
XML	eXtensible Markup Language

5 Appendix A – Data Harmonization Process Artifacts

The following is an overview of activities, inputs, and deliverables:

Phase	Task	Sub-Task	Input	Deliverable
Planning	Define Data Harmonization Project Scope		Project Scope Specification Template Human Services Community Need(s) Human Services Domain NIEM Issue & Requirements Management & Tracking Tool	Project Scope Specification
Planning	Develop Data Harmonization Project Work Plan/ Schedule		Project Work Plan/ Schedule Template Project Scope Specification	Project Work Plan/ Schedule
Planning	Planning Review		Project Scope Specification Project Work Plan/ Schedule Template Project Planning Review Exit Criteria	Project Planning Review Findings
Analysis	Identify Source Data	Collect Source Data Set Artifact(s)	Source Data Set Artifact(s) – Forms, Information Exchanges, Standards, etc.	Source Data Set Inventory Repository
Analysis	Identify Source Data	Extract Meta-Data from Source Data Set	Source Data Set Inventory Repository Meta-Data Extraction Form Template	Meta-Data Extraction Form(s)
Analysis	Identify Source Data	Validate Meta-Data Extraction	Meta-Data Extraction Form(s) Meta-Data Extraction Review Exit Criteria	Meta-Data Extraction Review Findings
Analysis	Standardize Meta-Data	Apply Human Services Data Standards to Extracted Meta-Data	Meta-Data Extraction Form(s) NIEM Human Services Domain Data Naming Standards Guide	Meta-Data Extraction Form(s) – Updated based upon standards
Analysis	Standardize Meta-Data	Consolidate Standardized Meta-Data into a Single Harmonization Project	Meta-Data Harmonization Checklist Meta-Data Harmonization Form Template	Meta-Data Harmonization Form

Phase	Task	Sub-Task	Input	Deliverable
Analysis	Standardize Meta-Data	Validate Standardized Data Set Artifact	Meta-Data Harmonization Form Meta-Data Standardization Review Exit Criteria	Meta-Data Standardization Review Findings
Analysis	Update Human Services Meta-Data Repository		Meta-Data Harmonization Form	Meta-Data Repository (Initialized/ Updated)
Analysis	Identify Candidate NIEM Requirements	Map Meta-Data to NIEM	Meta-Data Repository (Initialized/ Updated) Meta-Data to NIEM Mapping Template	Meta-Data to NIEM Mapping(s)
Analysis	Identify Candidate NIEM Requirements	Validate Meta-Data to NIEM Mappings	Meta-Data to NIEM Mapping(s) Meta-Data to NIEM Mapping Review Exit Criteria	Meta-Data to NIEM Mapping Review Findings
Analysis	Analysis Review		Source Data Set Inventory Repository Meta-Data Extraction Form(s) Meta-Data Extraction Review Findings Meta-Data Extraction Form(s) – Updated Meta-Data Harmonization Form Meta-Data Standardization Review Findings Meta-Data Repository (Initialized/ Updated) Meta-Data to NIEM Mapping(s) Meta-Data to NIEM Mapping Review Findings Project Analysis Review Exit Criteria	Project Analysis Review Findings

Phase	Task	Sub-Task	Input	Deliverable
Closure	Finalize all project artifacts		Source Data Set Inventory Repository Meta-Data Extraction Form(s) Meta-Data Extraction Review Findings Meta-Data Extraction Form(s) – Updated Meta-Data Harmonization Form Meta-Data Standardization Review Findings Meta-Data Repository (Initialized/ Updated) Meta-Data to NIEM Mapping(s) Meta-Data to NIEM Mapping Review Findings Project Analysis Review Findings	Source Data Set Inventory Repository (Final) Meta-Data Extraction Form(s) (Final) Meta-Data Extraction Review Findings (Final) Meta-Data Extraction Form(s) – Updated (Final) Meta-Data Harmonization Form (Final) Meta-Data Standardization Review Findings (Final) Meta-Data Repository (Initialized/ Updated) Meta-Data to NIEM Mapping(s) (Final) Meta-Data to NIEM Mapping Review Findings (Final) Project Analysis Review Findings (Final)
Closure	Collect Performance Measures		Performance Measure Report Template	Meta-Data to NIEM Mapping(s) (Final) Meta-Data to NIEM Mapping Review Findings (Final) Project Analysis Review Findings (Final) Performance Measure Report
Closure	Generate project reports		Lessons learned Template	Lessons learned Report

Phase	Task	Sub-Task	Input	Deliverable
Closure	Update repositories		Source Data Set Inventory Repository (Final) Meta-Data Extraction Form(s) (Final) Meta-Data Extraction Review Findings (Final) Meta-Data Extraction Form(s) – Updated (Final) Meta-Data Harmonization Form (Final) Meta-Data Standardization Review Findings (Final) Meta-Data Repository (Initialized/ Updated) (Final) Meta-Data to NIEM Mapping(s) (Final) Meta-Data to NIEM Mapping Review Findings (Final) Project Analysis Review Findings (Final) Performance Measure Report Lessons learned Report	Issue and Requirements Management and Tracking (Updated) Interoperability Initiative Document Repository (Updated) NIEM.gov Human Services Domain Community web site (Updated)
Closure	Closure Review		Issue and Requirements Management and Tracking (Updated) Interoperability Initiative Document Repository (Updated) NIEM.gov Human Services Domain Community web site (Updated) Project Closure Review Exit Criteria	Closure Review Findings

Table 2 NIEM Human Services Data Harmonization Process Artifacts (Inputs and Deliverables)

6 Appendix B – Data Harmonization Process Roles

The following is an overview of activities, roles, and responsibilities:

Phase	Task	Sub-Task	Domain Steward Manager	Domain Governance Group	Business and Technology Team	Interoperability Initiative Sub-group on Collaboration to CMS & CCIO	Tiger Team
Planning	Define Data Harmonization Project Scope		R/A	R/A	C		I
Planning	Develop Data Harmonization Project Work Plan/ Schedule		I	I	C		R/A
Planning	Planning Review		R/A	R/A	C		I
Analysis	Identify Source Data	Collect Source Data Set Artifact(s)		I			R/A
Analysis	Identify Source Data	Extract Meta-Data from Source Data Set		I			R/A
Analysis	Identify Source Data	Validate Meta-Data Extraction	I	I	R/A		I
Analysis	Standardize Meta-Data	Apply Human Services Data Standards to Extracted Meta-Data		I			R/A
Analysis	Standardize Meta-Data	Consolidate Standardized Meta-Data into a Single Harmonization Project		I			R/A
Analysis	Standardize Meta-Data	Validate Standardized Data Set Artifact	I	I	R/A		I
Analysis	Update Human Services Meta-Data Repository			I			R/A
Analysis	Identify Candidate NIEM Requirements	Map Migrated Meta-Data to NIEM		I	C		R/A
Analysis	Identify Candidate NIEM Requirements	Validate Migrated Meta-Data to NIEM Mappings	I	I	R/A	C	I
Analysis	Analysis Review		R/A	R/A	C		I
Closure	Finalize all project artifacts			I			R/A
Closure	Collect Performance Measures			I			R/A
Closure	Generate project reports			I			R/A
Closure	Update repositories			I			R/A
Closure	Closure Review		R/A	R/A	C		I
Responsible - Having control or authority over an activity; Accountable - Subject to the obligation to report, explain, or justify something regarding an activity; Consulted - Provide advice or information regarding an activity; and Informed - Receive information regarding an activity							

Table 3 NIEM Human Services Harmonization Process Roles (RACI Chart)