US Department of Education

Federal Student Aid

Integration Leadership Support Contractor

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Task 18 - Enterprise Data Management

18.002 Enterprise Data Management Concept of Operations

Final

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Executive Summary

Federal Student Aid is engaged in a long-term effort to integrate its processes, data and systems. To better support these business objectives and to emphasize data as an enterprise asset, Federal Student Aid is in the process of establishing a formal Enterprise Data Management (EDM) program. The goal of the EDM program is to consistently define data and make standardized data available across the enterprise by providing information services and data technology expertise to business owners, project managers and architects.

This document describes a three-year vision for the EDM program, including: 1) EDM functional areas and their activities, 2) the EDM organization structure with roles and responsibilities, and 3) EDM operational scenarios. This document also prioritizes the tasks required to establish the EDM program within the three-year timeline.

The EDM program has six functions. These functions perform the following activities:

- **Data Policy and Strategic Planning** - Defines EDM strategic direction and promotes compliance with EDM policies, procedures and standards.
- **Data Governance and Metadata Management** - Implements data governance processes to maintain standardized data definitions and associated metadata, and uses the metadata to guide, control and integrate data activities and products.
- **Data Architecture** - Promotes sharing of database assets, the use of an integrated architecture to support enterprise-wide data movement, access to common data, data transformation and migration.
- **Data Warehousing** - Facilitates sharing of Business Intelligence data across the enterprise, and promotes the use of standards for data acquisition, transformation and delivery.
- **Data Quality** - Institutionalizes a set of repeatable processes to continuously monitor data and improve data accuracy, completeness, timeliness and relevance.
- **Data Security -** Creates and promotes data security and privacy standards, tools, and best practices to protect Federal Student Aid data.

Each EDM function has a set of roles that carry out the specific activities and create specific deliverables. The EDM Team provides data services to business owners, project managers and architects during the enterprise visioning phase, the initiative visioning phase, and throughout the OneED lifecycle stages. The EDM Team plans to implement the proposed EDM functions and capabilities in multiple phases.

The EDM management will use this document to:

- Communicate EDM functions and vision to business unites and community of interest.
- Evaluate necessary components and processes so that sufficient resources may be planned for and obtained.
- Identify and acquire funding necessary for EDM initiatives.

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Section 1: Introduction

This section introduces the Enterprise Data Management (EDM) Concept of Operations (CONOP) document. Subsection 1.1 describes the background of the EDM CONOP document and its purpose. Subsection 1.2 introduces the Data Management Association (DAMA) Data Management Framework, which serves as the basis for the Federal Student Aid CONOP. Subsection 1.3 discusses the scope of this document.

1.1 Background

In 2006, Federal Student Aid identified the need to establish an EDM program that will centrally manage all data assets. The goal of the EDM program is to provide data-related services to Federal Student Aid business units and to improve enterprise analytics. This document describes, at the conceptual level, a three-year vision for such an EDM program, including its functions, organization and operations.

The EDM management will use this document to:

- Communicate EDM functions and vision to business unites and community of interest.
- Evaluate necessary components and processes so that sufficient resources may be planned for and obtained.
- Identify and acquire funding necessary for EDM initiatives.

1.2 Usage of DAMA Functional Framework

This document references the Data Management Body of Knowledge (DMBOK) Functional Framework published by DAMA, updated in June 2006, as a blue print in identifying and organizing data management functional areas. (The DAMA Framework can be accessed at http://www.dama.org/files/public/Data_Management_Framework_5-3-06.ppt.)

The data management profession is still maturing. As a result, there remains widespread confusion about terms, methods, tools, and opinions in the field. DAMA created the DMBOK in order to standardize data management related terms, functions, and deliverables. The Functional Framework is an overview of the DMBOK structure. It points data management professionals to specific parts of the DMBOK for further reading of authoritative publications.

The DAMA Functional Framework divides the data management field into nine functional areas:

- Data Stewardship, Strategy and Governance
- Data Architecture, Analysis and Design
- Database Administration
- Data Security Management

- Metadata Management
- Data Warehousing (DW) and Business Intelligence (BI)
- Reference and Master Data Management
- Data Quality Improvement
- Unstructured Data Management

For each of the functional areas, DAMA Functional Framework specifies the activities that should be performed to carry out the functions. The DAMA Framework provides good coverage of all areas an EDM program should cover, but it is not intended to recommend an organization structure. Federal Student Aid has re-organized these nine functional areas and their associated activities into six functions. Federal Student Aid tailored some functions and activities to meet the specific EDM needs of business units and community of interest.

1.3 Scope

The EDM CONOP:

- Identifies the functions required for effective enterprise data management.
- Presents an organization structure, roles and responsibilities.
- Discusses operational scenarios that provide data-related services to the enterprise.
- Describes the high-level collaboration between the EDM Team and their stakeholders.
- Describes a high-level plan for the implementation of the EDM program.

1.4 Document Structure

This document is organized into the following sections.

- **Section 1: Introduction,** discusses the CONOP background, scope, purpose, and the document structure.
- **Section 2: EDM Functions,** presents the EDM functions and their activities.
- **Section 3: EDM Roles and Responsibilities,** presents the organization structure, and roles and responsibilities of each EDM function.
- **Section 4: EDM Operational Scenarios,** illustrates interactions and collaboration between the EDM Team and its stakeholders.
- **Section 5: High-Level EDM Implementation Plan,** prioritizes the tasks required to implement the EDM program vision over the three-year time frame.
- **Appendix A: Acronyms,** defines all acronyms used in this document.
- **Appendix B: References,** lists documents referenced in this EDM CONOP.

Section 2: EDM Functions

This section identifies the EDM functions and describes their activities as sub-functions. Subsection 2.1 provides an overview of the functions. Subsections 2.2 through 2.7 describe each function in more detail.

2.1 EDM Functions Overview

The Federal Student Aid EDM program consists of six functions. These functions are grouped according to the data management functional areas defined by the DAMA framework. Table 2-1 lists the functions and maps them to DAMA framework.

EDM Functions	DAMA Framework Functions
Data Policy And Strategic Planning	Part of Data Stewardship, Strategy and Governance (including strategic plan, data policies, budgeting, resource management, program communications, program management)
Data Governance And Metadata Management	• Part of Data Stewardship, Strategy and Governance (including identification of data stewards and the establishment of the data council) • Metadata Management • Part of Reference and Master Data Management (including reaching consensus on the definitions of shared data)
Data Architecture	• Data Architecture, Analysis and Design • Part of Reference and Master Data Management (including technology standards for implementing reference and master data management) • Database Administration • Unstructured Data Management
Data Warehousing	Data Warehousing and Business Intelligence
Data Quality	Data Quality Improvement
Data Security	Data Security Management

Table 2-1. Mapping of Federal Student Aid EDM Functions to DAMA Framework Functions

The goal of the Data Policy and Strategic Planning function is to support the EDM program in strategic planning, data policies, compliance with policies, EDM performance measurement, and program management. The technical functions of the EDM program are Data Governance and Metadata Management, Data Architecture, and Data Warehousing. Staff will work closely with business owners and project

managers/architects to create and maintain technical artifacts that are in compliance with the EDM data policies, procedures and processes. These functions provide technical expertise to development projects across the enterprise and promote the reuse of data artifacts for creating consistent and integrated solutions.

The goal of the Data Quality function is to promote enterprise-wide data quality initiatives. The Data Quality function is supported by the three EDM technical functions as quality issues arise in respective areas. The goal of the Data Security function is create and promote data security and privacy standards, tools, and data access best practices to protect Federal Student Aid data from loss, theft, misuse, and unauthorized access.

2.2 Data Policy and Strategic Planning

Data Policy and Strategic Planning is comprised of the following sub-functions:

- Perform EDM Strategic Planning
- Define Data Policies
- Promote Compliance with Data Policies, Procedures and Standards
- Publicize and Promote Data Management
- Identify and Justify Resources and Budget Needs
- Monitor EDM Program Performance
- Coordinate with External Standards Organizations
- Coordinate with EA Compliance Activities

Table 2-2 describes these sub-functions in detail.

Sub-function	Description
Perform EDM Strategic Planning	Define EDM program mission, goals and objectives, organizational structure, roles and responsibilities, and operations.
Define Data Policies	Develop and implement enterprise-wide policies governing the creation and usage of data and metadata.
Promote Compliance With Data Policies, Procedures	Work with Federal Student Aid stakeholders to socialize data policies, procedures and standards, and to institutionalize them within the system development lifecycle. The goal is to promote and enforce, when applicable, compliance with policies, procedures and standards.
Publicize And Promote Data Management	Communicate the value of the EDM program to internal and external stakeholders
Identify and Justify Resources and Budget Needs	Define staffing and budgeting requirements to support all EDM initiatives.
Monitor EDM Program Performance	Define EDM program key performance indicators, gather performance data, use the Chief Information Office (CIO) repository to track and manage program performance data, and recommend improvements to EDM program management.

Sub-function	Description
Coordinate With External Standards Bodies	Represent Federal Student Aid in relevant external standard bodies and participate in standards setting activities.
Coordinate With Enterprise Architecture (EA) Compliance Activities	Provide data to the EA Team for the Office of Management and Budget (OMB) EA compliance reporting.

Table 2-2. Data Policy and Strategic Planning Sub-functions

2.3 Data Governance and Metadata Management

Members of the Data Governance and Metadata Management function facilitate consensus between business users on data definitions, formats, and relationships. Federal Student Aid maintains these data standards in a metadata repository and Extensible Markup Language (XML) Registry and Repository for the Education Community. The metadata repository and XML Registry and Repository capture enterprise-wide business requirements, and are used to guide, control and integrate data activities and products.

The Data Governance and Metadata Management function is comprised of the following sub-functions:

- Define Data Governance Process
- Implement Data Governance Process
- Create, Capture and Maintain Enterprise Metadata (Data Standardization)
- Develop and Implement Enterprise Metadata Architecture
- Create and Maintain Master Data Management (MDM) Standards

Table 2-3 describes these sub-functions in more detail.

Sub-function	Description
Define Data Governance Process	Design and implement a governance framework for defining a consistent view of all business-driven data elements. The governance framework should: • Designate data stewardship responsibilities among both business and IT organizations. • Define a virtual governance hierarchy with participation from business, IT operations and management. • Define the roles and responsibilities of data stewards • Establish a set of procedures used to define, review and approve data standards.
Implement Data Governance Process	• Identify and coordinate data stewards. • Establish and coordinate the Data Stewardship Council. • Follow procedures to define, review and approve data standards.

Sub-function	Description
Create, Capture and Maintain Enterprise Metadata (Data Standardization)	• Create standardized definitions for data elements, attributes and schemas in an online registry. • Capture and maintain enterprise shared metadata, including, but not limited to, naming standards, data classification, business rules, data models, data dictionary, data format standards, and descriptions of shared services.
Develop and Implement Enterprise Metadata Architecture	Enable the creation, storage, manipulation, control, integration, distribution, use and change management of enterprise-level shared metadata. Enterprise Metadata Architecture consists of: • Create and maintain a metadata strategy. • Inventory and integrate decentralized metadata tools. • Define and execute change management procedures for enterprise metadata repositories and the XML registry.
Create And Maintain Master Data Management (MDM) Standards	Serve as the liaison among business owners to: • Define authoritative sources of shared data entities. • Build organization consensus for the logical data structures of shared data elements. • Define and capture, as part of the enterprise metadata, the business rules that govern the creation and updates of shared data elements.

Table 2-3. Data Governance and Metadata Management Sub-functions

2.4 Data Architecture

Members of the Data Architecture function promote standards for logical and physical data models, data engineering, database design, and Master Data Management (MDM). While the Data Governance and Metadata Management function focuses on standardizing data definitions, formats and relationships, the Data Architecture function focuses on efficient implementation of those standards. Data Architecture promotes sharing of database assets and the use of an integrated architecture to support enterprise-wide data movements, access to common data, and data migration.

The Data Architecture function is comprised of the following sub-functions:

- Develop and Maintain The Enterprise Data Model
- Develop and Maintain Modeling And Design Standards
- Establish and Maintain Enterprise Data Architecture
- Develop and Maintain Data Integration and Master Data Management Architecture
- Provide Database Administration (DBA) Support
- Assess Application Integration Interface
- Evaluate Tools

Table 2-4 below describes these sub-functions in detail.

Sub-function	Description
Develop and Maintain the Enterprise Data Model	• Develop the Enterprise Conceptual Data Model (ECDM), that reflects standard data entities and their relationships across the enterprise. • Develop a fully attributed Enterprise Logical Data Model (ELDM) that expands upon the entities and relationships from the ECDM. • Implement a change management process for the ECDM and ELDM. Validate the ECDM and ELDM against evolving business needs. • Facilitate migration and integration of project data models with enterprise data models. • Support the development of enterprise-compliant logical and physical data models within individual systems development projects.
Develop and Maintain Modeling and Design Standards.	Define standards methods, techniques, notation and tools for developing data models at the enterprise and project levels.
Establish and Maintain Enterprise Data Architecture	Assist enterprise application architects in defining the layout of high-level data components that will provide business users with consistent and high-quality data. These components include databases, data sharing services, data delivery services and systems.
Develop and Maintain Data Integration and Master Data Management Architecture	Define and promote technology standards, such as Enterprise Information Integration (EII) and Service-oriented Architecture (SOA) that define data sharing infrastructure, middleware and data access services.
Provide Database Administration (DBA) Support	Define and promote DBA and data engineering best practices in the following fields: • Performance measurement, such as metrics on data volumes • Data migration • Archival strategies • Physical Database Design • Database Implementation and Change Control • Backup and Recovery • Performance and Tuning
Assess Application Integration Interface	Coordinate the assessment of custom or Commercial Off-The-Shelf (COTS) systems' ability to integrate with other systems based on Federal Student Aid's data integration technical standards.
Evaluate Tools	Participate in the assessment of data modeling, data integration and metadata tools., Define requirements, develop evaluation criteria, and assess risks related to data management.

Table 2-4. Data Architecture Sub-functions

2.5 Data Warehousing

Members of the Data Warehousing function promote the use of standards and an integrated architecture for data acquisition, transformation and delivery in order to meet enterprise reporting and analytical needs.

The Data Warehousing function is comprised of the following sub-functions:

- Develop and Maintain Enterprise Dimensional Data Models
- Develop DW and BI Architecture
- Develop DW and BI Technical Standards

Table 2-5 describes these sub-functions in detail.

Sub-function	Description
Develop and Maintain Enterprise Dimensional Data Models	Create enterprise dimensional data models, with standardized dimensions and facts.
Develop DW and BI Architecture	Define and promote a high-level target enterprise data warehousing architecture that specifies all data sources, operational data stores, data warehouses, data marts, data delivery applications and interfaces..
Develop DW and BI Technical Standards	Define enterprise technical standards for data acquisition, data transformation, data integration and data delivery.

Table 2-5. Data Warehousing Sub-functions

2.6 Data Quality

Joseph M. Juran, a world-renowned pioneer in the field of quality management, defines data to be of high quality if the data are fit for "their intended uses in operations, decision making and planning." (Juran, Joseph M. and A. Blanton Godfrey, *Juran's Quality Handbook*.) Thus data quality involves "getting the right and correct data in the right place at the right time to complete the task at hand." (Juran, Joseph M. and A. Blanton Godfrey, *Juran's Quality Handbook*.)

Data Quality measures data's fitness for use in terms of a set of attributes critical for Federal Student Aid. These attributes include accuracy, completeness, timeliness, relevance, level of detail and simplicity. The Data Quality function establishes repeatable processes that will monitor data quality and will achieve continual improvement of data quality.

The Data Quality function is comprised of the following sub-functions:

- Perform Data Profiling
- Measure Data Quality
- Manage Data Quality

Table 2-6 describes these sub-functions in detail.

Sub-function	Description
Perform Data Profiling.	• Understand and document the different uses of data by Federal Student Aid, such as operations, decision support or compliance. • Analyze and assess the current state of data quality and identify data quality challenges.

Sub-function	Description
Measure Data Quality.	• Define and document mission-critical data attributes and associated metrics that measure data quality for different uses. • Define the target metric levels that achieve the quality goals. • Define the data quality goals.
Manage Data Quality.	Establish a process to continuously improve Federal Student Aid data quality. This process should follow an iterative data quality lifecycle: • A **definition** phase that refines quality criteria, including the metrics and rules, based on changing business needs • An **assessment** phase that applies quality criteria to gauge the quality level. • A **cleansing** phase that resolves gaps identified during the assessment phase and initiates necessary policy and procedure adjustments to improve data quality. • On going **monitoring** to track data quality and to report variations to data stewards. Changing business needs constantly feed requirements into this cycle and drive the process.

Table 2-6. Data Quality Sub-functions

2.7 Data Security

Members of the Data Security function define standards to protect Federal Student Aid data from a wide range of threats. The goal is to protect data confidentiality, improve data integrity, minimize risks, and comply with laws and regulations.

Data Security is comprised of the following sub-functions:

- Develop and Implement Data Security and Privacy Standards
- Develop and Promote Data Security and Privacy Best Practices
- Perform Data Security Auditing

Table 2-7 describes these sub-functions in detail.

Sub-function	Description
Develop and Implement Data Security and Privacy Standards.	• Develop security and privacy standards that comply with Federal, state and local laws, regulations Federal standards and Department of Education policies. These standards should cover the following areas: o Data risk analysis and data classification o Data view administration o Data access permission administration o Data in transmission security
Develop and Promote Data Security Best Practice.	• Identify industry best practices to design and develop secure data architecture. • Inventory the current state of data security and privacy practices that are currently in use by Federal Student Aid. • Develop and promote enterprise data security and privacy strategies.
Perform Data Security Auditing.	• Develop polices and procedures for the creation, retention, management and usage of audit trails. • Conduct data security and privacy audits.

Table 2-7. Data Security Sub-functions

Section 3: EDM Organization, Roles and Responsibilities

This section describes the structure of the proposed EDM organization that will carry out the functions and sub-functions as described in Section 2. Subsection 3.1 presents an organization chart. Subsection 3.2 lists the roles and responsibilities for each portion of the EDM organization.

3.1 EDM Program Organizational Structure

Figure 3-1 is the proposed EDM organization and its roles.

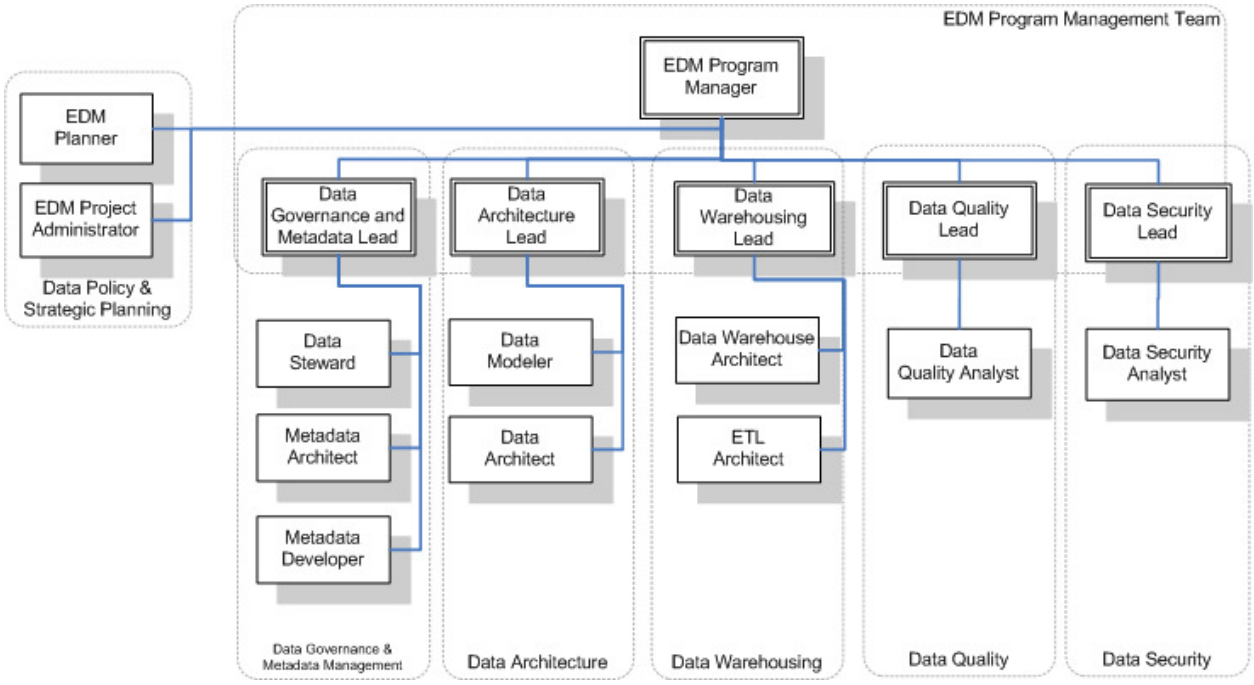

Figure 3-1. EDM Organizational Structure

Note that Figure 3-1 does not represent positions, but rather roles and their relationships in order to implement the EDM functions presented in Section 2**.** One person could perform multiple roles.

3.2 EDM Roles and Responsibilities

Table 3-1 defines the responsibilities (mapped to sub-functions listed in Section 2) of each role and deliverables that each role will produce. (Note that many sub-functions and deliverables require collaboration between several roles. The sub-functions and deliverables are mapped to their primary owners.)

Roles	Responsibilities	Deliverables
EDM Program Manager	• Set direction for the EDM Program. • Prioritize EDM program initiatives. • Advocate the EDM value to executive management. • Promote EDM standards and services to business units and the community of interest. • Lead the activities of providing data related services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Represent the EDM program in external organizations. • Resolve team, management and program issues. • Review and approve all EDM team deliverables.	• Strategic Plan • Vision • Mission • Charter • CONOP • Communications Plan • Data Policies • EDM Performance Measures • EDM Budget and Resource Plan • EDM Program Self-Assessment
EDM Planner	Support the EDM Program Manager in the following sub-functions of the Data Policy and Strategic Planning function, listed in Table 2-2: • Perform Strategic Planning. • Define Data Policies.	Support the EDM Program Manager in creating and maintaining the following deliverables: • Strategic Plan • Vision • Mission • Charter • CONOP
EDM Project Administrator	Support the EDM Program Manager in the following sub-functions of the Data Policy and Strategic Planning function, listed in Table 2-2: • Justify Resource and Budget Needs. • Monitor EDM Program Performance. • Coordinate with External Standards Organizations. • Coordinate with EA Compliance Activities.	Support the EDM Program Manager in creating and maintaining the following deliverables: • Resource Plan • Budget • Communications plan • EDM Program Self Assessment

Roles	Responsibilities	Deliverables
Data Governance and Metadata Management Lead	• Set Data Governance and Metadata Change Management Procedures. • Lead the implementation of Data Governance Process. • Plan and lead data standardization activities. • Coordinate the activities of providing metadata services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Be responsible for the quality of all deliverables of the Data Governance and Metadata Management function. • Promote the use of EDM metadata assets. • Participate in setting EDM program direction as a member of the EDM Program Management Team.	• Data Governance Process • Metadata Change Management Procedures • Note: Work already exists for this deliverable. For XML Registry and Repository change management, PESC has published a policy and procedures manual for submission of standard data elements into the repository and registry, which can be found at http://www.pesc.org/info/policies/Manual-Finalv1-0-0.doc. • Data Standardization Sequencing Plan
Data Stewards	Perform the following sub-functions of the Data Governance and Metadata Management function, listed in Table 2-3: • Implement the data governance process. • Capture and maintain enterprise metadata. • Provide metadata services in various stages of enterprise visioning, initiative visioning, and project lifecycle management.	• XML Core Components in the PESC XML Registry and Repository • Enterprise Data Dictionary • Other metadata elements, including naming standards, business rules, taxonomies, etc.
Metadata Architect	• Perform the sub-function of Developing and Implementing Enterprise Metadata Architecture, listed in Table 2-3. • Provide metadata services in various stages of enterprise visioning, initiative visioning, and project lifecycle management.	• Enterprise Metadata Vision and Strategy • Metadata Inventory • Enterprise Metadata Integration Architecture • Maintain and administer the metadata repository

Roles	Responsibilities	Deliverables
Data Architecture Lead	• Set data modeling and data engineering standards. • Lead the definition of Enterprise Data Architecture, Data Integration and MDM Architecture. • Promote the adoption of Data Architecture artifacts. • Lead the assessment of application interface and tools. • Coordinate the activities of providing Data Architecture-related services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Be responsible for the quality of all deliverables of the Data Architecture function. • Provide technical advice to the EDM Program Manager on the impacts on EDM of project lifecycle management tool selection. • Participate in setting EDM program direction as a member of the EDM Program Management Team.	• Data Modeling Standards and Change Management Procedures • ECDM • ELDM • Data Model Repository • Enterprise Data Architecture • Enterprise Data Integration and Master Data Management Architecture • Data Migration Standards • Archival Strategy • Volume Metrics
Data Modeler	• Perform the sub-function of Developing and Maintaining Enterprise Data Models, listed in Table 2-4. • Provide data modeling support in various stages of enterprise visioning, initiative visioning, and project lifecycle management.	Support Data Architecture Lead in creating and maintaining the following deliverables: • ECDM • ELDM • Data Model Repository

Roles	Responsibilities	Deliverables
Data Architect	Support the Data Architecture Lead in performing the following sub-functions of the Data Architecture function, listed in Table 2-4: • Establish and Maintain Enterprise Data Architecture. • Develop and Maintain Data Integration and Master Data Management Architecture. • Provide DBA Support. • Application Integration Interface Assessment. • Evaluate Tools. • Provide data architecture support in various stages of enterprise visioning, initiative visioning, and project lifecycle management.	Support Data Architecture Lead in creating and maintaining the following deliverables: • Enterprise Data Architecture • Data Integration and MDM Architecture • Data Migration Standards • Archival Strategy
Data Warehousing Lead	• Set DW and BI Technical Standards • Lead the definition of Enterprise DW and BI Architecture. • Lead the definition of Enterprise Dimensional Data Model. • Be responsible for the quality of all deliverables of the Data Warehousing function. • Coordinate the activities of providing Data Warehousing-related services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Promote the adoption of Data Warehousing artifacts. • Participate in setting EDM program direction as a member of the EDM Program Management Team.	• Enterprise DW and BI Architecture • DW and BI Technical Standards (such as conformed dimensions, standard metrics, ETL standards, warehouse metadata, and Audit/Balance/Control, Service Level Agreement, Data Transformation Rules, Performance Monitoring, etc.) • Enterprise Dimensional Data Model
Data Warehouse Architect, ETL Architect	Support the Data Warehousing Lead in performing the following sub-functions of the Data Warehousing function, listed in Table 2-5: • Develop and Maintain Enterprise Dimensional Data Model. • Develop DW and BI Architecture. • Develop DW and BI Technical Standards.	Support the Data Warehousing Lead in defining and maintaining the following deliverables: • Enterprise DW and BI Architecture • DW and BI Technical Standards • Enterprise Dimensional Data Model

Roles	Responsibilities	Deliverables
Data Quality Lead	• Define and implement Data Quality Management Processes. • Define and enforce Data Quality policies and procedures • Define Data Quality metrics, measurements, and target levels. • Be responsible for the quality of all deliverables of the Data Quality function. • Coordinate the activities of providing Data Quality-related services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Participate in setting EDM program direction as a member of the EDM Program Management Team.	Support the Data Quality Lead in defining and maintaining the following deliverables: • Data Quality Scorecard • Policies and Procedures for Defect Resolution • Data Quality Management Processes
Data Quality Analyst	Support the Data Quality Lead in performing the following sub-functions of the Data Warehousing function, listed in Table 2-6: • Perform Data Profiling. • Measure Data Quality. • Manage Data Quality.	• Data Profiles • Data Quality Scorecard (in support of the Data Quality Lead)
Data Security Lead	• Develop and promote Data Security standards and architecture best practices. • Lead Data Security auditing. • Be responsible for the quality of all deliverables of the Data Security function. • Coordinate the activities of providing Data Security-related services in all stages of enterprise visioning, initiative visioning, and project lifecycle management. • Participate in setting EDM program direction as a member of the EDM Program Management Team.	• Data Security and Privacy Standards • Data Security Architecture Best Practices
Data Security Analyst	Support the Data Security Lead in performing the following sub-functions of the Data Security function, listed in Table 2-7: • Develop and Implement Data Security Standards. • Develop and Promote Data Security Best Practice. • Perform Data Security Auditing.	Support the Data Security Lead in defining the following deliverables: • Data Security and Privacy Standards • Data Security Architecture Best Practices

Table 3-1. EDM Roles, Responsibilities and Deliverables

Section 4: EDM Operational Scenarios

This section presents a high-level view of how the EDM Team interacts with its stakeholders. Subsection 4.1 introduces the types of stakeholders and interactions. Subsections 4.2 and 4.3 describe two high priority processes that apply to the whole EDM program.

4.1 EDM Program Operational Context

The EDM Team plays the role of setting data-related standards, policies and procedures. The EDM Team also promotes compliance with these standards, policies and procedures. The EDM Team will interact with the following four stakeholder groups within Federal Student Aid:

- Executive Sponsorship and Enterprise Governance, which provides strategic directions (Note that as the time of this writing, January 2007, the Executive Sponsorship and Governance group refers to a generic function, not specific organizations in operation at Federal Student Aid.)
- Business Owners, who are the EDM partners in defining and enforcing data standards
- Project Managers and Architects, who request services from the EDM Team and provide feedback to the EDM program
- The Integration Team and the EA Team which provide enterprise integration and EA support

In addition, the EDM Team works closely with external standards organizations, such as Federal Enterprise Architecture (FEA)-Data Architecture Subcommittee (DAS), Postsecondary Electronics Standards Council (PESC), and National Council of Higher Education Loan Programs (NCHELP).

In order to effectively reach its operational objectives, the EDM Team has identified five scenarios to summarize all of its interactions with these stakeholder groups. These scenarios are:

1. Create and maintain data management artifacts (such as ECDM and ELDM).
2. Provide data management services to projects. These services include all EDM program activities to make its artifacts available for reuse in system design and architecture throughout the development lifecycle.
3. Manage the enterprise-wide data quality program, where EDM program data quality managers drive the process of continuously monitoring and resolving data quality issues.
4. Manage the enterprise-wide data governance program, where the EDM program data stewards work closely with business content owners and IT structural owners to reach consensus on all aspects of a data element.
5. Represent the EDM program in participating in standards setting activities with external organizations.

Subsections 4-2 and 4-3 present an overview of Scenarios 1 and 2. Note that there will be separate deliverables describing the data quality program (scenario 3), and the data governance process (scenario 4).

The EDM Team's participation in external standards-setting organizations (scenario 5) depends on the processes of individual organizations. Thus Scenarios 3, 4 and 5 are not described in detail in this document.

4.2 Create and Maintain EDM Artifacts

The EDM Team is responsible for various kinds of artifacts, including data policies, strategic plan, data dictionary, enterprise target data architecture, and a data quality management process. Figure 4-1 depicts a generic process that applies to the creation and updating of all these artifacts.

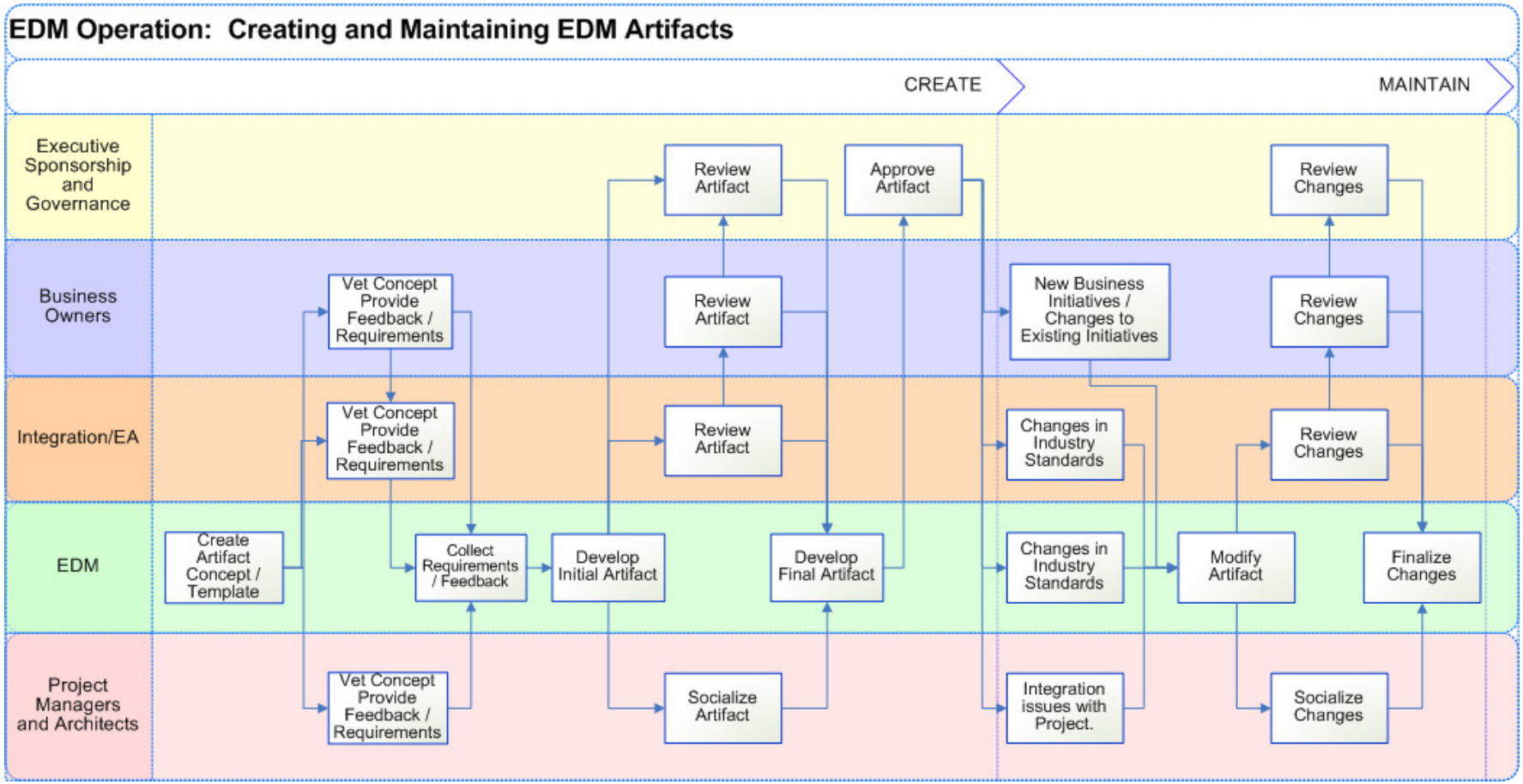

Figure 4-1. General Process Flow for Creating and Maintaining EDM Artifacts

4.3 Provide Data Services to Projects/Systems

The swimlane diagram below, Figure 4-2, shows how the EDM Team collaborates with Integration/EA to actively support an initiative starting from the visioning phase all the way through the full OneED life cycle management (LCM) stages. Please note that Figure 4-2 does not describe a step-by-step process that the players, listed in the left most column, follow in defining the enterprise vision, initiative vision, and supporting LCM artifacts, but rather it intends to show the roles and responsibilities of each player as the life cycle progresses when read horizontally along the swimlanes, and their collaboration in every stage when read vertically.

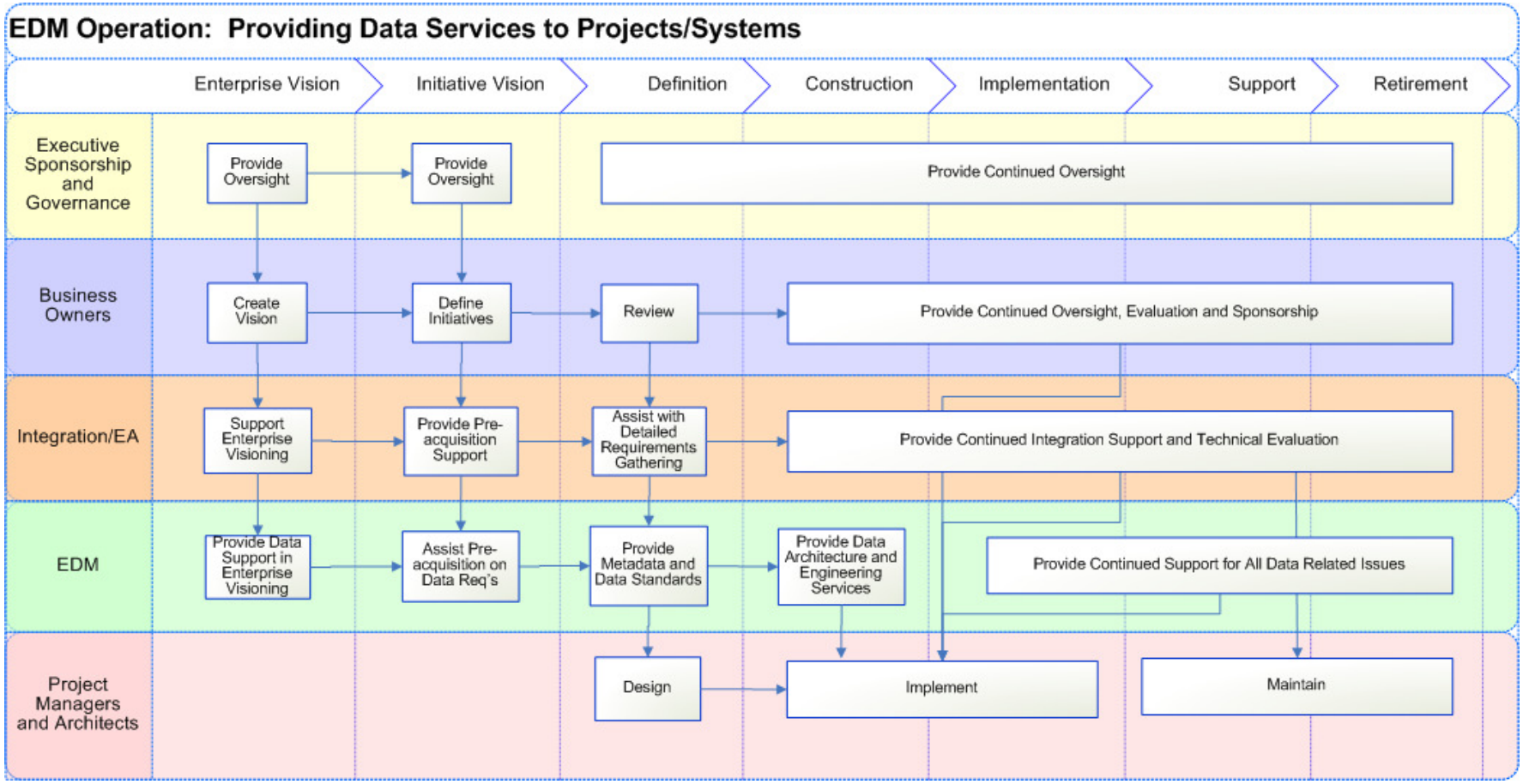

Figure 4-2. Providing Data Services to Projects

Figure 4-2 illustrates the EDM Team first supports visioning activities, and then provides artifacts and expertise on data definitions and data architecture to service a project in its data design and data engineering efforts. The EDM Team performs its responsibilities in close partnership with the four internal stakeholder groups as identified in subsection 4.1. The following bullets further describe the roles played by these stakeholder groups and the EDM Team at each step of the enterprise life cycle:

- During the Enterprise Vision phase, Business Owners, under the oversight of executive management, create the enterprise target state. Integration and EA provide support to the business owners in the areas of Target State Vision, current systems, business processes and functions, integration framework, and general technical architecture. At the same time, the EDM Team provides input from the data perspective to ensure that the Enterprise Vision reflects the needs for shared data elements. The EDM Team also gathers data requirements from such participation.

- During the Initiative Vision phase, Business Owners and Executive Management continue to play their leadership and oversight roles in defining initiatives. Integration, EA and the EDM Team will continue to provide inputs. Once the initiatives are defined, Integration and EA supports the pre-acquisition activities by specifying requirements in both business and technical areas. The EDM Team provides assistance on the data requirements.

- Starting from the Definition stage, the EDM Team supplies project managers/architects with the artifacts created and maintained by various Data Governance and Metadata Management sub-functions, which are described in subsection 2.3. Artifacts, such as enterprise data models, data dictionary, naming standards, metadata repository and registry, promote the use of consistent data standards across projects. The EDM Team also provides standards and best practices in Data Quality and Data Security as inputs into the design stage.

- In the Implementation stage, the EDM Team provides engineering and technical support for the design and development of data components, such as physical data models, databases, data sharing services and interfaces, and data security architecture. The architecture and technology standards created and maintained by Data Architecture, Data Warehousing and Data Security functions, described in Subsections 2.4 and 2.5, form the foundation for the EDM program's services at this stage.

- For the remainder of the lifecycle stages, the EDM Team continues to provide data design and data engineering support to projects. The EDM Team also collects feedback and refines its artifacts periodically.

Throughout the process of enterprise visioning, initiative visioning, and LCM stages, the EDM program's services help projects by developing data-related work products and by promoting compliance with the enterprise data standards and best practices.

Section 5: High Level EDM Implementation Plan

Federal Student Aid plans to implement the EDM program in multiple phases. This section outlines a high level roadmap for the next three years. Subsection 5-1 provides an overview of the implementation strategy. Subsection 5-2 describes each year's priorities. Subsection 5-3 maps functions to the years in which they are implemented.

5.1 Implementation Plan Overview

Given the complexity of enterprise data management and constraints on resources and timeline, Federal Student Aid has decided to follow an incremental approach to implement the EDM program. At the writing of this document (January 2007), Federal Student Aid has planned three years of the EDM program implementation and clearly defined priorities for each year. This plan is based on two guidelines:

- Improve the EDM processes so that they progress through a series of stages, from their initial definition, to repeatable processes, to being well defined and widely followed, and finally to becoming optimized.
- Develop mature processes related to high priority sub-functions first.

Each individual sub-function may be at a different level of process maturity. The EDM Team plans to give top priority to Data Governance, Enterprise Metadata, and Enterprise Data Models, and will develop other areas as long as resources are available. These top priority items capture Federal Student Aid data requirements and form the foundation for all other EDM program artifacts.

5.2 High Level Implementation Plan by Year

In year one, the EDM Team will create the foundation of the EDM program, and pilot-test high priority processes and artifacts. The objectives of the first year include:

- Define the mission, goals and objectives of the EDM program organization and complete the EDM program strategic planning activities.
- Establish the EDM program organization by obtaining budget and staffing for the most urgently needed initiatives.
- Take inventory of existing data management and metadata artifacts and plan for their reuse.
- Begin performing some of the Data Governance and Metadata sub-functions, including defining and implementing Data Governance processes; capturing shared metadata artifacts; and defining policies and procedures for metadata change management.
- Create and refine enterprise data models.

- Create data migration best practices.
- Begin to define data quality policies and procedures.
- Provide services to support Integrated Partner Management (IPM) project and gather lessons learned.

In year two, the EDM Team plans to refine established data policies and expand and improve its service capabilities. The specific objectives are:

- Operationalize enterprise data governance processes and expand metadata usage to service system development needs.
- Complete the artifacts and processes required for supporting Data Governance and Metadata Management function.
- Perform more Data Architecture and Data Warehousing functions by defining architecture artifacts and technical standards.
- Define and implement data quality metrics, measurements, and processes.
- Improve the processes, by which the EDM Team provides data services at each phase of the system development lifecycle.

By the end of year two, the artifacts and repeatable processes related to the high priority sub-functions should have been created and established. The EDM Team will then focus on improving maturity of the artifacts and processes. The objectives for year three are:

- Complete artifacts and process required for supporting Data Architecture and Data Warehousing functions.
- Improve the Data Quality management processes.
- Begin to define Data Security and Privacy standards
- Establish the EDM program as the key source of data-related artifacts and expertise in Data Governance and Metadata Management, Data Architecture, and Data Warehousing.
- Institutionalize the processes by which the EDM Team promotes and enforces data standards, policies and procedures.

5.3 EDM Program Implementation Plan by Function Deliverables

Table 5-1 illustrates key deliverables that will be defined in each of the first three years of the EDM Program operation.

Sub-Function	Year 1	Year 2	Year 3
Data Policy and Strategic Planning	• Strategic Plan • Vision • Mission • Charter • CONOP • Communications Plan • Data Policies • EDM Performance Measures • EDM Budget and Resource Plan • EDM Program Self-Assessment	Continued updates	
Data Governance and Metadata Management	• Data Governance Process • Data Standardization Sequencing Plan • XML Core Components in the PESC XML Registry and Repository • Enterprise Metadata Vision and Strategy • Metadata Inventory	• Metadata Change Management Procedures • Enterprise Data Dictionary • Enterprise Metadata Integration Architecture • Other metadata elements, including, naming standards, business rules, taxonomies, etc.	Continued updates
Data Architecture	• Data Migration Standards • ECDM • ELDM • Data Model Repository	• Data Modeling Standards and Change Management Procedures • Enterprise Data Architecture • Enterprise Data Integration and Master Data Management Architecture • Archival Strategy • Volume Metrics	Continued updates
Data Warehousing		• Enterprise DW and BI Architecture • Enterprise Dimensional Data Model	• DW and BI Technical Standards

Sub-Function	Year 1	Year 2	Year 3
Data Quality	• Policies and Procedures for Defect Resolution	• Data Quality Scorecard • Data Quality Management Process	Continued updates
Data Security			• Data Security and Privacy Standards • Data Security Architecture Best Practices

Table 5-1. EDM Implementation Plan by Functions

Appendix A. Acronyms

The following acronyms are used in this document.

Acronym	Definition
ABC	Audit, Balance, Control
BI	Business Intelligence
BTIG	Business Technology Integration Group
CONOP	Concept of Operations
COTS	Commercial Off The Shelf
DAMA	Data Management Association
DAS	Data Architecture Sub-committee
DMBOK	Data Management Body of Knowledge
DW	Data Warehouse
EA	Enterprise Architecture
ECDM	Enterprise Conceptual Data Model
EDM	Enterprise Data Management
EII	Enterprise Information Integration
ELDM	Enterprise Logical Data Model
EMT	Executive Management Team
ERD	Entity Relationship Diagram
ETL	Extract, Transform, Load
FEA	Federal Enterprise Architecture
ILSC	Integration Leadership Support Contractor
OMB	Office of Management and Budget
OPEPD	Department of Education Office of Planning, Evaluation and Policy Development
NCHELP	National Council of Higher Education Loan Programs

Acronym	Definition
PESC	Postsecondary Electronics Standards Council
SLA	Service Level Agreement
SOA	Service Oriented Architecture
TSV	Target State Vision
UDDI	Universal Description, Discovery and Integration
XML	Extensible Markup Language

Table B-1. Acronyms

Appendix B. References

This document references the following documents:

- Mark Mosley, *Data Management Association Data Management Functional Framework*, updated in June 2006 (http://www.dama.org/files/public/Data_Management_Framework_5-3-06.ppt).
- *Postsecondary Electronics Standards Council (PESC) Policy and Procedures Manual*, http://www.pesc.org/info/policies/Manual-Finalv1-0-0.doc, 4/2005.
- Juran, Joseph M. and A. Blanton Godfrey, *Juran's Quality Handbook*, Fifth Edition, p. 2.2, McGraw-Hill, 1999.