

Information Technology Policy

Data Modeling Standards

ITP Number ITP-INF003	Effective Date August 2, 2005
Category Information	Supersedes None
Contact RA-ITCentral@pa.gov	Scheduled Review May 2022

1. Purpose

This Information Technology Policy (ITP) establishes enterprise-wide standards for data modeling practices and supporting software, and to promote their effective usage for application development projects.

Establishing data modeling standards will ensure standardization and harmonization of business entities, define a common business definitions and provide guidance to agencies as they plan for new application development projects or make significant investments in existing applications.

2. Scope

This ITP applies to all offices, departments, boards, commissions, and councils under the Governor's jurisdiction (hereinafter referred to as "agencies"). Agencies not under the Governor's jurisdiction are strongly encouraged to follow this ITP.

Third-party vendors, licensors, contractors, or suppliers shall meet the policy requirements of this ITP that are applicable to the products and services provided to the Commonwealth.

3. Definitions

- 3.1 Citizen** - a person, business, or other entity obtaining services, either directly or indirectly, from the Commonwealth of Pennsylvania.
- 3.2 Citizen Experience** – the full series of interactions or steps that a Citizen takes when seeking a Service or a series of Services and has a discrete beginning and end.
- 3.3 Citizen Experience Goals** – measureable outcomes related to the Citizen Experience that Agencies identify to drive performance improvement and inform Citizen expectations for services delivery.
- 3.4 Citizen Experience Standards** – a set of rules, principles, and current best practices common to all Agencies under the Governor's Jurisdiction that guide the delivery of Services to Citizens.
- 3.5 Citizen Profile** – the unique data associated with a Citizen and contains information that is used by the Enterprise to facilitate a specific Service for the Citizen.
- 3.6 Services** - a collection of Enterprise processes and procedures to deliver

something of value to a Citizen.

4. Objective

This policy sets forth the standards that shall be followed by Commonwealth of Pennsylvania application development organizations in the preparation and maintenance of data models describing the data definitions, data structures as well as data relationships supporting Commonwealth applications. Data modeling best practices and basic guidelines on data modeling are provided in the accompanying BPD-INF003C *Data Modeling Best Practices* and STD-INF003B *Data Modeling Basics* documents. The STD-INF003A *Data Modeling Products and Standards* document lists recommended software products that support the data modeling function.

The main objectives of this policy are to:

- Promote a standardized and harmonized commonwealth-wide definitions
- Promote commonwealth wide usage of common business and technical definitions including business rules and metadata
- Promote and support the use of Data Administration and Data Modeling within the Commonwealth.
- Increase collaborations, data sharing opportunities across agencies, reduce data redundancy, and improve application interoperability.
- Promote agencies to adopt the principle of One – new models focused on digital initiatives for One (common) data model definitions
- Increase opportunities for consolidation of like data and business processes.
- Standardize and reduce proliferation of Data Modeling Software tools that best meet current and future enterprise wide data requirements, considering traditional, legacy, and web-based application development efforts.
- Leverage and reuse existing Data Models to the maximum extent possible
- Build and start a foundation to avoid siloed definitions and rigid models and define a single enterprise business and technical model characterized with common definitions, common relationships, service oriented flexible and scalable model.

5. Policy

All new application development projects will be required to use one of the current standard Data Modeling Software products as defined in STD-INF003A *Data Modeling Products and Standards*. Likewise, all new application development projects are required to adhere to BPD-INF003C *Data Modeling Best Practices*. Existing production applications are encouraged to adopt these standards as well. All IT projects related to application development or database design will be subject to review for compliance with this standard.

The practice of Data Modeling helps with the identification of business requirements and the resolution of problems earlier in the development cycle, promotes effective communication of design ideas to the teams during the discovery and design phases of the process, and provides a strong foundation for future changes to the data.

Benefits of Data Modeling

The table below presents a summary of the various levels of models that may be developed to define and support the business as well as the perspectives from which these models are used in the development process.

Model Name	Perspective	Model Description	Type of Model	Entity	Type of Relation
Business Model	Business Owner	Semantic Model	Conceptual	Business Entity	Business

System Model	Designer, Enterprise / System Architecture	Logical Data Model	Logical	Entity relati onshi ps	Data Structures
Technology Model	Data Database Administrator / Functional team responsible	Data Design	Physical	Table/ Segments	Key/Pointer Data dictionary and cardinality
Detailed Representation	Developer	Data Definitions		Field and data types	Field names, definitions and PK-FK relationships

Model Types:

There are three basic types of data models: conceptual, logical, and physical.

Conceptual data models - These models, sometimes called domain models, are typically used to define domain concepts, define the business structures associated, and to identify underlying business rules, with project stakeholders. Conceptual models allow organization and definition of business entities. They are directly related to the business processes and signify the model purpose. Conceptual data models are often created as the precursor to Logical Data Models or as alternatives to Logical Data Models.

Logical data models (LDMs) - Logical Data Models are used to further explore the domain concepts, and their relationships. The logical data models enables architects to define a technology agnostic data semantics, relationships, data structures and business rules. The architects are responsible for ensuring that the right semantics are used for implementation of the conceptual data models and provide guidance on LDM definitions. This could be done for the scope of a single project or for your entire enterprise. Logical Data Models depict the logical entity types, typically referred to simply as entity types, the data attributes describing those entities, and the relationships, and relationship cardinalities, between the entities.

Physical data models (PDMs) - Physical Data Models are used to design the internal schema of a database, and depict the data tables (derived from the logical data entities), the data columns of those tables (derived from the entity attributes), and the relationships between the tables (derived from the entity relationships).

The physical data models detail the implementation of the logical data model, compliant with the conceptual data model, for a specific technology. The details of metadata and granular system and data structure relevant information including referential integrity, business rules and definitions are core part of the PDMs.

Data models are foundations of defining the enterprise data definitions. The importance of the data models are increasing due to Commonwealth moving towards standardized common definitions and data driven transformations. This will enable to ensure consistent data definitions/business significance, standardized business and technical structures, promote a high level of standardization and over time phase out incorrect and redundant systems & system of systems. Further, they will be the key entities require for security definitions – system, data and cyber.

Data Models are a valuable source of information, providing a graphical depiction of data at different levels of abstraction. For example, the owner of a business process is interested in

the conceptual view (conceptual model) of data. The designer and/or data administrator is interested in the logical view (logical model, also referred to as the transformation layer). The database administrator is typically concerned with the physical model and the physical implementation of a relational database.

A brief primer on the practice of data modeling and the function of each of the above model types is presented in the supplemental document STD-INF003B *Data Modeling Basics*. Please refer to this document for further details on each model type and explanations of steps used in the process. Whenever new systems are developed, or existing systems enhanced, these modeling steps are to be followed. Corresponding models should also be created at the appropriate stages of discovery and design. Subsequently, models should be managed effectively to promote reuse.

Data Modeling Best Practice Standards Supported:

A list of Data Modeling Best Practice Standards has been compiled by the Office of Data and Digital Technology (ODDT). These standards are presented in the BPD-INF003C *Data Modeling Best Practice* document. The list has applicability across all current standard products and is required to be used for all application development efforts.

A data modeling methodology is currently being developed to provide additional guidance to agencies and will become part of the System Development Methodology. A citizen data model is also being developed and can be found in BPD-INF003D *Core Citizen Data Model and Data Elements*. is currently being developed to provide additional guidance to agencies.

Defining a Core Citizen Data Model and Data Elements will:

- Assist in delivery of consistent and user-friendly experiences across all digital Services.
- Assist online destinations to have a consistent look and feel to ensure a single identity for Enterprise Services.
- Ensure all citizen information is concise, in plain language, and current.
- Facilitate and Govern the ongoing transition of traditional non-digital services to a digital service platform.
- Establish a Citizen-First framework that promotes the innovative spirit and skills of the Enterprise through its personnel and technologies.
- Identify and Improve programs managing data, privacy, risk, and accessibility associated with Citizen Data.

The ODDT was engaged to set Data Modeling Standards and Best Practice Standards for the Commonwealth. The domain team evaluated the Data Modeling Software tools currently deployed within the Commonwealth, considering such factors as the projected market longevity; existing platform, technical and overall vendor support; performance and management functionality; and other relevant business and technical criteria to support the recommendation.

6. Responsibilities

- 6.1 Agencies shall comply with the requirements as outlined in this ITP.
- 6.2 Office of Administration, Office of Information Technology shall comply with the requirements as outlined in this ITP.
- 6.3 Third-party vendors, licensors, contractors, or suppliers creating custom applications on behalf of Commonwealth entities shall adhere to the practices outlined in the ITP.

7. Related ITPs/Other References

Definitions of associated terms of this policy are published on the Office of Administration's public portal: <http://www.oa.pa.gov/Policies/Pages/Glossary.aspx>

Commonwealth policies, including Executive Orders, Management Directives, and IT Policies are published on the Office of Administration's public portal:

<http://www.oa.pa.gov/Policies/Pages/default.aspx>

- Executive Order 2019-04 *Establishing a "Citizen-First" Government and Promoting Customer Service Transformation*
- Management Directive 205.34 Amended *Commonwealth of Pennsylvania Information Technology Acceptable Use Policy*
- STD-INF003A *Data Modeling Products and Standards*
- STD-INF003B *Data Modeling Basics*
- BPD-INF003C *Data Modeling Best Practices*
- BPD-INF003D *Core Citizen Data Model and Data Elements*

8. Authority

Executive Order 2016-06 *Enterprise Information Technology Governance*

9. Publication Version Control

It is the [Authorized User](#)'s responsibility to ensure they have the latest version of this publication, which appears on <https://itcentral.pa.gov> for Commonwealth personnel and on the Office of Administration public portal: <http://www.oa.pa.gov/Policies/Pages/default.aspx>. Questions regarding this publication are to be directed to RA-ITCentral@pa.gov.

10. Exemption from This Policy

In the event an agency chooses to seek an exemption from the guidance within this ITP, a request for a policy waiver is to be submitted via the enterprise IT policy waiver process. Refer to [ITP-BUS004 IT Policy Waiver Review Process](#) for guidance.

This chart contains a history of this publication's revisions. Redline documents detail the revisions and are available to CWOPA users only.

Version	Date	Purpose of Revision	Redline Link
Original	08/2/2005	Base Document	N/A

Revision	11/18/2010	ITP Refresh	
Revision	05/13/2021	ITP Refresh New ITP Templates and updated language Updated Exemption Section Updated Scope	Revised IT Policy Redline <05/13/2021>