



Whitemarsh
Information Systems Corporation

*Metabase Overview,
Meta Model Entity Relationship Diagrams,
and the Knowledge Worker Framework
April 2015*

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Metabase Overview, Meta Model Entity Relationship Diagrams, and the Knowledge Worker Framework

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Rationale for Metabase¹

No one would ever question why a business needs its finance books. Well, the metadata repository is the business's information systems' books. If you cannot run a good business without the former, you cannot run good information systems environment without the latter.

A significant portion of the time and costs associated with resolving the Year 2000 problem can be directly attributed to a lack of a quality metadata environment within information systems organizations. The fact that one information system organization within an enterprise had virtually no Year 2000 problem while another organization within that same enterprise was running their information systems shop "24x7" was no accident. The former had a long history of metadata management and the later thought metadata was a wasted overhead expense.

Vital to database success is control over semantics. The controls are mainly in the area of the definitions that form the basis of the interfaces to standard processes (e.g., computing net profit) and the standard data definitions (e.g., what does profit *mean*?).

It is not necessary, however, to control the interfaces to the *end user*. Just how a data entry screen or report looks to different people is immaterial so long as the enforced semantics (rules of meaning and usage) are the same.

In the development of large data processing projects dealing with enterprise-wide, indispensable business functions, documentation of the design requirements and resulting information system specifications is seldom accomplished such that it is timely, accurate, or complete. That is disastrous for the following three reasons:

- Only the momentous facts that are remembered are recorded.
- As systems are specified, the lower-level design details are redundantly developed, often in conflicting manners.

- As system components are maintained, the efforts are crippled because of the undocumented business knowledge that is essential to understanding the component.

Amelioration of these three important problems starts with organizations adopting formal methods for performing analysis and design. Formal methods are only measurably productive and repeatable if they are very detailed and proceduralized. Such detail, however, dehumanizes knowledge workers, who, in turn, are certain to generate protests about being production workers on an assembly line, which, by the way, is worthwhile only when all of its products are the same. In contrast, to the production line, business information system designs are unique assemblies of large sets of components, many of which are similar in design.

Designing business information systems is not an activity for the production worker; rather, it is an activity for a knowledge worker. While there is clearly procedure to both activities, designing an information system requires individualized applications of creativity, human factors techniques, and rule making. Accordingly, requiring the robot-like use of a fully detailed methodology cannot result in responsive information system designs. Work plans must be drawn from proven techniques against which metrics have been captured and honed over the years.

Building a business information system, once it is designed in sufficient detail, is largely a rote application of computer language coding. There are a number of quality and robust code generators that can use the metadata for a business information system design to produce computer code that is competitive in performance to a human coded application. There is, of course, no comparison between human coding costs and code generator costs.

To fully respond to the three problems cited above, knowledge workers should have the freedom to create their own analysis and design work products for data and processes within strictures dealing with format, time, quality, and resources. These work products must be placed into a metabase. The metabase, containing these products



in fixed formats and sequences, can be accessed by code generators (both human and computerized) to build the business information system. If the generator is quick enough, a fully functional version of the business information system design can be live-tested a short time later. As design flaws are found, the metabase's metadata can be changed and the business information system regenerated. *In short, an interactive design process, in which the metabase is the empowering component.*

Traditionally, it is not uncommon to expend 20 percent of a total systems development lifecycle on requirements and design. The remaining 80 percent is expended on building, testing, and documentation. Once implemented, 500 percent more is spent over a system's lifecycle for changes, fixes, and evolutions, also in a 20/80 ratio. The overall total is 600 percent. If, with code generators, the 80 percent is reduced to effectively zero, then there must also be a profound reduction in the 500 percent systems lifecycle maintenance.

Metabase Components

The metabase concept implemented as a database application includes:

- Business Information Systems
- Business Events
- Data Elements
- Database Objects
- Documents and Forms
- Implemented Data Models
- Missions, Organizations, and Functions
- Operational Data Models
- Requirements Management
- Resource Life Cycle Analysis
- Specified Data Models
- Use Cases

- View Models

Whitemarsh has implemented these into discrete database applications with Clarion for Windows by the SoftVelocity Corporation (www.softvelocity.com). These metabase systems operate on Windows 98, NT, 2000, XP and 2003 computing environments. Clarion for Windows was chosen because it meets the Whitemarsh requirements of sophisticated code generators coupled with sophisticated metadata management within its environment. Metabase environments are distributed to Whitemarsh website members in the form of SQL loadable metadata. The data management engine of the metabase is SQL via ODBC. Access to metabases can be through ODBC clients such as Crystal Reports.

Metabase Benefits

The complete set of metadata components map onto the complete life cycle of database application, that is, its:

- Specification
- Implementation
- Operation (and maintenance)

The following is a partial list of benefits attained through the use of a metabase. A metabase will:

- Assist top management in identifying the resources required to build an information system.
- Provide discipline and control for the design process.
- Provide a structured approach to conceptual design.
- Enhance the application development process through the utilization of prior work.



- Provide a management facility for monitoring database projects.
- Allow for the nonredundant storage of data definitions and business policies that produce greater consistency throughout the enterprise.

project management tools, and seminars. These are all geared to achieve four objectives:

- Increase productivity
- Increase quality
- Decrease cost
- Decrease risk

Relationship to the Knowledge Worker Framework

The metabase does not exist in isolation. It is the metadata repository for the Whitemarsh Knowledge Worker Framework, which correlates very closely with the majority of the Federal Enterprise Architecture Framework.

The table on the next page depicts the knowledge worker framework. As John Zachman so often says, “Someday, you are going to wish you had all those models, enterprise wide, horizontally and vertically integrated at an excruciating level of detail.” That is easy to say, and may even be easy to believe, but is there any proof? The figure that follows the knowledge worker framework diagram presents the percentages of projects that fail when the metadata inferred by the cell has not been created, employed and maintained. Simply put, yes there is proof to Zachman’s admonition..

On every serious project the savings derived from Whitemarsh product use has exceeded their cost.

Related Materials

The Knowledge Worker Framework is described in detail in the Knowledge Worker Framework book that is available on the Whitemarsh website, www.wiscorp.com. Also available on the website is the Metabase system and user guides and also the Data Modeler Architecture and Concept of Operations.

Supporting the Whitemarsh metabase and the knowledge worker framework is a large collection of courses, books, methodologies,



Metabase Overview, Meta Model Entity Relationship Diagrams, and the Knowledge Worker Framework

Knowledge Worker Framework						
Deliverables	Mission	Man-Machine Interface				
		Machine		Interface	Man	
		Database Object	Business Info System	Business Event	Business Function	Organization
Scope	List of business missions	List of major business resources	List of business information Systems	List of interface events	List of major business scenarios	List of organizations
Business	Mission hierarchies	Resource Life Cycles	Information sequencing and hierarchies	Event sequencing and hierarchies	Business scenario sequencing and hierarchies and use cases	Organization charts, jobs and descriptions
System	Policy hierarchies	Data Elements, Specified data models and Identified Database objects	Information system designs	Invocation protocols, input and output data, and messages	Best practices, quality measures and accomplishment assessments	Job roles, responsibilities, and activity schedules
Technology	Policy execution enforcement	Implemented data models and Detailed Database Objects	Information systems application designs	Presentation layer information system instigators	Activity sequences to accomplish business scenarios	Procedure manuals, task lists, quality measures and assessments
Deployment	Installed business policy and procedures	Operational data models	Implemented information systems	Client & server windows and/or batch execution mechanisms	Office policies and procedures to accomplish activities	Daily schedules, shift and personnel assignments
Operations	Operating business	Application Interface data model	Operating information systems	Start, stop, and messages	Detailed procedure based instructions	Daily activity executions, and assessments

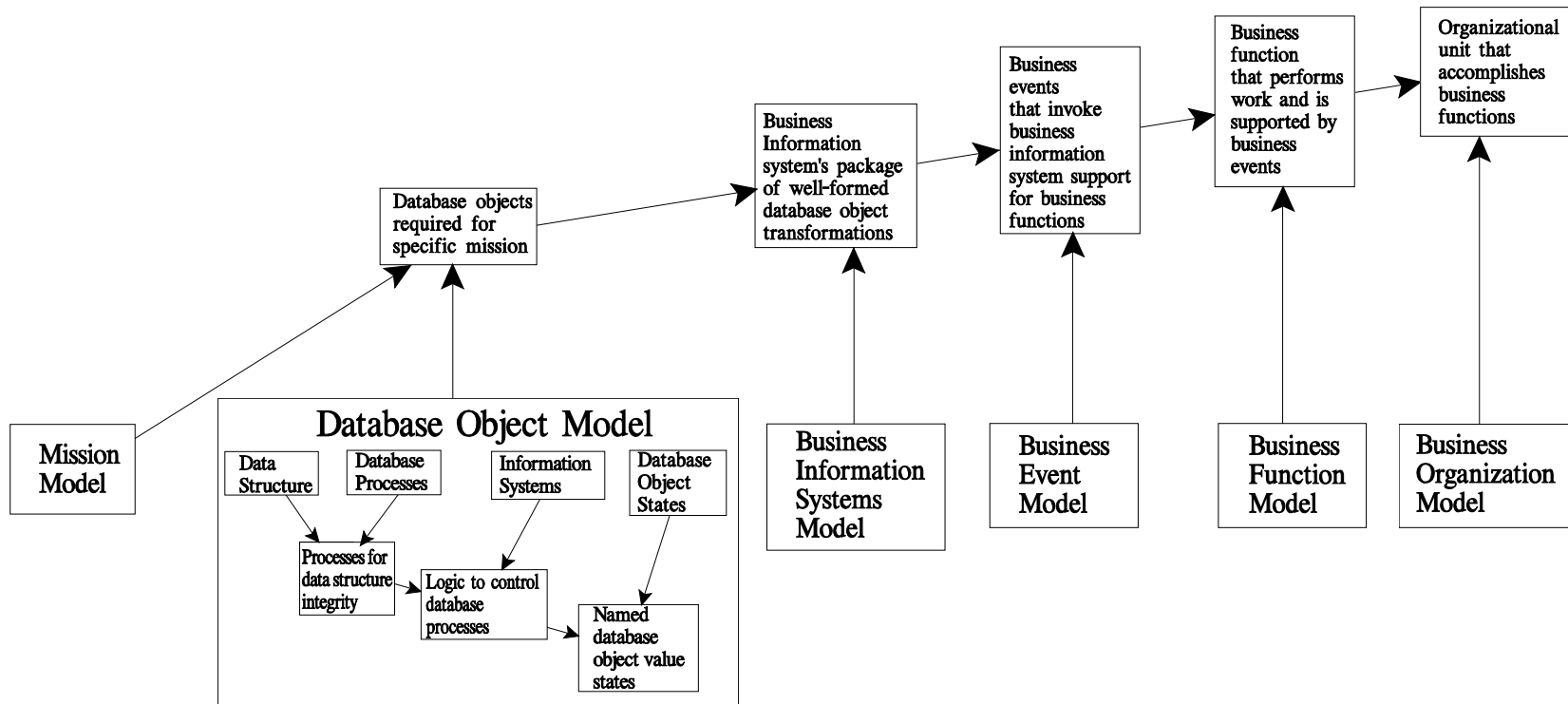


Knowledge Worker Framework							Row Totals of GAO Allocated Errors in Percent
Deliverables	Mission	Man-Machine Interface					
		Machine		Inter-face	Man		
		Database Object	Business Information System	Business Event	Business Function	Organization	
Scope	5	2	3	1	3	4	18
Business	5	3	2	1	6	6	23
System	3	2	2	1	12	8	28
Technology	1	0	0	0	8	6	15
Deployment	0	0	0	0	5	5	10
Operations	0	0	0	0	3	3	6
Col. Totals	14	7	7	3	37	32	100

Note: All numbers expressed as Percent allocations of errors to cells ...12 Gray cells are Information Technology Cells. If IT were Zero Percent Failure, 95% of all IT Systems would still fail.



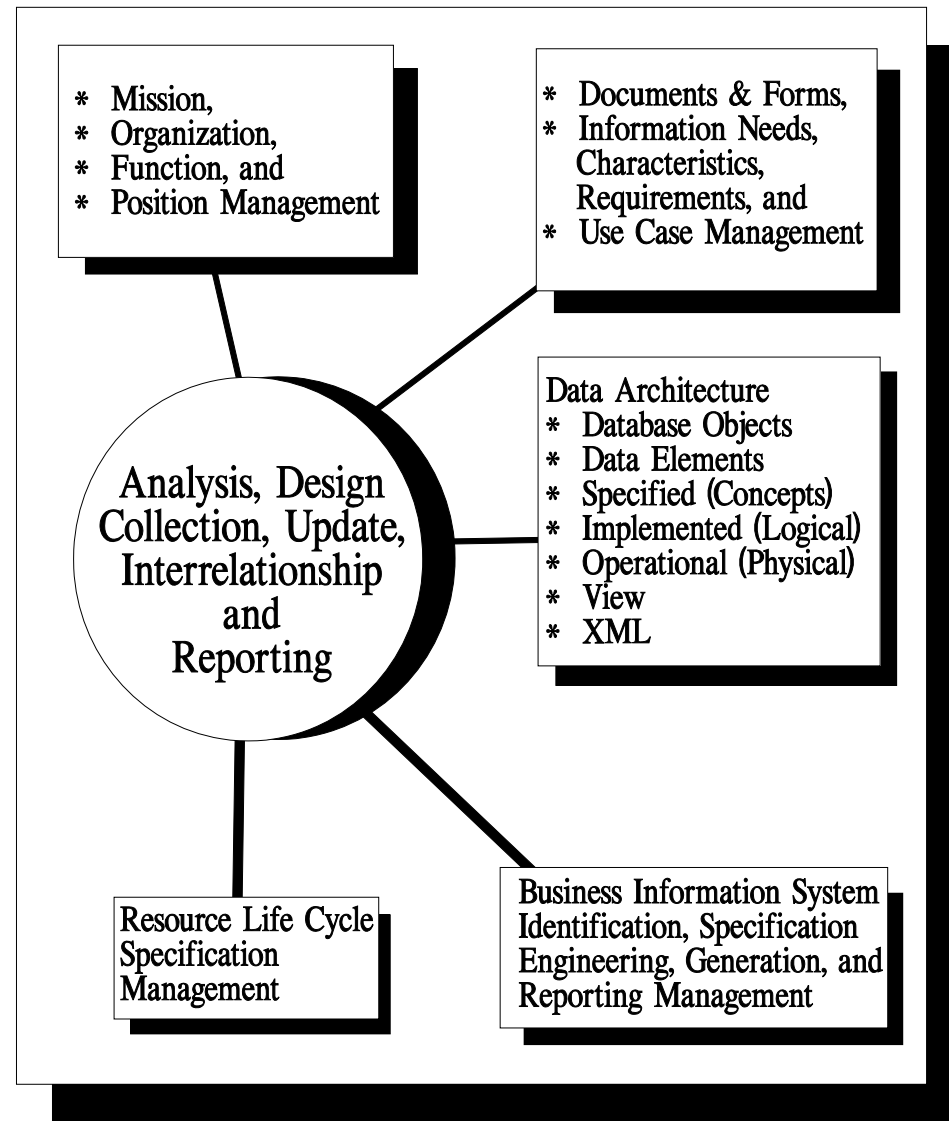
Relationship Among Knowledge Worker Framework Columns



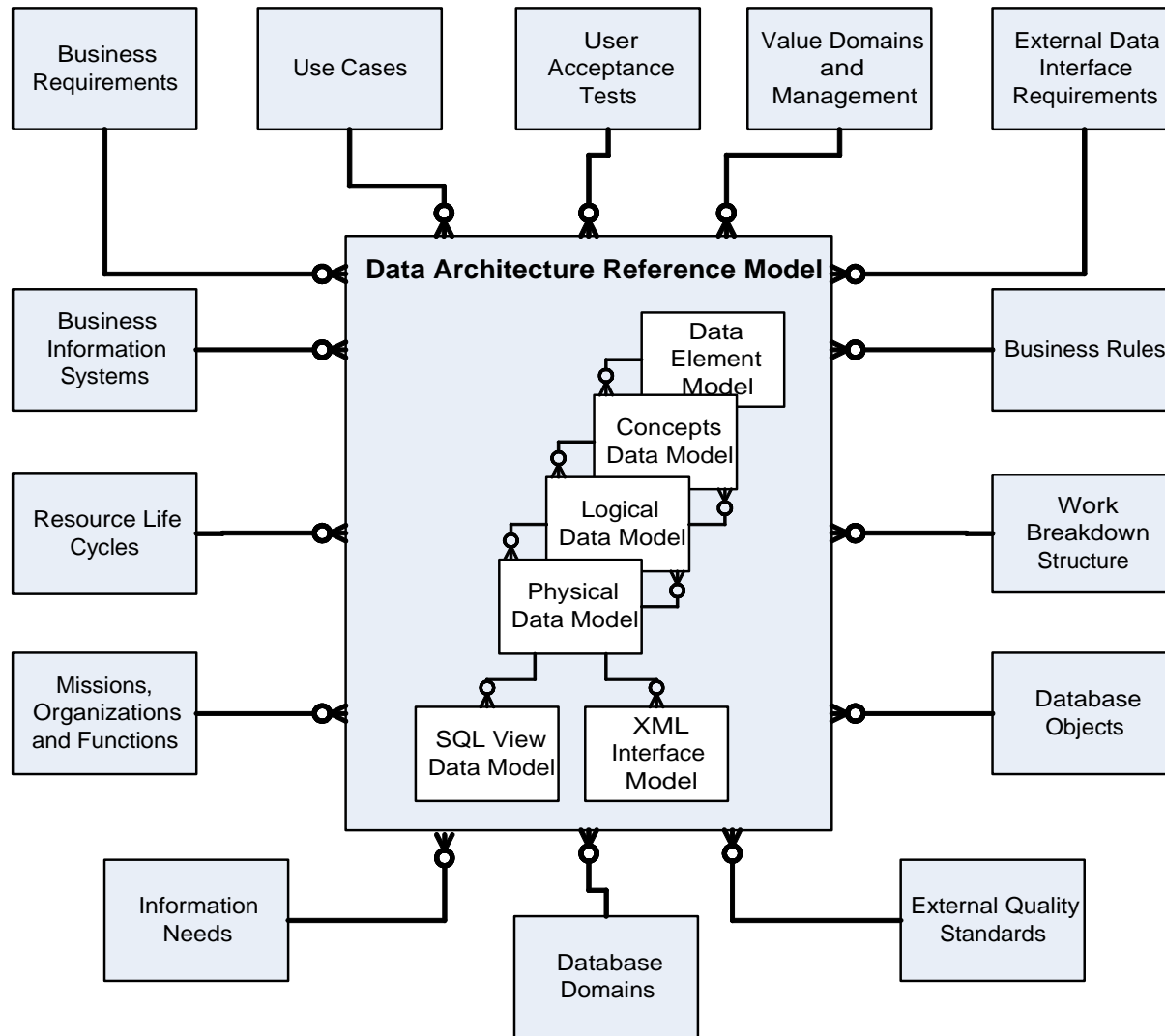
Each Knowledge Worker Framework column generally defines a key metabase model



Metabase: The Metadata Repository for the Knowledge Worker



Data Architecture Data Models Role as SDLC Work Product Integrator



Employing the Metabase within the Knowledge Worker Framework

		Knowledge Worker Framework					
		Mission	Database Objects	Business Information System	Business Event	Business Function	Business Organization
Metabase Software Module							
Mission, Organization, Function Position Assignment		✓			✓	✓	✓
Resource Life Cycles			✓	✓			
Document & Form, Information Needs Analysis, Requirements, Use Cases, and Data Integrity Rule Specification & Binding				✓		✓	
Data Modeler	Data Elements						
	Specified Data Model						
	Implemented Data Model		✓				
	Operational Data Model		✓	✓			
	View Data Model		✓	✓	✓		
Business Information Systems, Reports, and Wire Frames				✓			
Information Systems Planning		✓	✓	✓	✓	✓	✓



Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
Business Information Systems: <i>What are the business information systems, where are they, how are they related to mission, organization, function, and databases. What is the impact on these business information systems when policy (a.k.a., data) is required or changed.</i>			✓			
Data Element Model: <i>What are the context independent business facts and their specifications that can be deployed to fully define the semantics that define these business facts, or that form the basis for these business facts as they are refined through the allocation of semantic and data use modifiers. Where are these data element semantics deployed throughout the various data models whose facts (attributes, columns, DBMS columns, and View columns are based on these facts.</i>		✓				
Data Integrity Rule Specification and Binding: <i>What are the rules that govern the integrity of data that is specified across all the deployed uses of that data. How are these rules defined and where are they bound such they are defined once and bound where appropriate? What are the processes and how are these processes executed that ensure data integrity during all data object operations?</i>		✓	✓			



Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
Database Objects: <i>What are the major data-based object classes and objects that form enterprise databases. What are the state-based process life cycles for these data-based object classes? What are the database record (i.e., table-based) processes that control the fundamental integrity of individual database records. What are the data-based object class business information systems that transform database objects from one predefined value-state to another?</i>		✓	✓			
Document and Form: <i>What documents and forms provide critical information about the enterprise? How are those documents and forms interrelated one with the other? How are these materials subdivided and then properly related to specific functions performed by organizations in the accomplishment of missions? How are these able to be related to certain View columns?</i>	✓	✓	✓	✓	✓	✓
Enterprise Architecture Management: <i>What are the five distinct architectures that comprise the over set within the enterprise, and how are these architectures intersected and mapped to the Knowledge Worker Framework in support of projects that contribute to the build rationale and sequence of an overall Information Systems Plan?</i>	✓	✓	✓	✓	✓	✓
Functions: <i>What are the human-based processes performed by groups in their achievement the various missions of the enterprise from within different enterprise organizations? What human processes are common across and within organizations, business events and by indirection, business information systems and databases?</i>					✓	



Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
Implemented Data Model: <i>What are the database models that are able to be employed as the basis of operational databases that can be employed by business information systems? What are the database implementations of data-based concepts contained in the specified data models? What are the various columns, including value domains, data integrity processes, and data types that are an implementation of various data elements and/or attributes from specified data models that defined concepts?</i>		✓				
Information Needs Analysis: <i>What information (a.k.a. query results or reports) is needed by various organizations in their functional accomplishment of missions and what databases and information systems provide this information?</i>		✓	✓			
Missions: <i>What are the essential missions that define the very existence of the enterprise, and that are the ultimate goals and objectives that measure enterprise accomplishment from within different business functions and organizations?</i>	✓				✓	✓
Operational Data Model: <i>What are the actual databases and models that are employed by business information systems? What are the databases and models that operationally specify data-based specifications from DBMS independent database models? What are the various DBMS columns, including value domains, data integrity processes, and data types that are an implementation of various data elements and/or attributes from specified data models that defined concepts?</i>						



Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
Organizations: Which organizations are accomplishing what aspects of missions with what databases, information systems and through which functions?	✓			✓	✓	✓
Project Management. What are the various knowledge worker projects that address one or more collections of activities that create an IT work product that supports the enterprise? What are the detailed deliverables, collections of tasks, assigned staff, work accomplishment resources, and work environment factors that affect the accomplishment of project work. What are all the different projects by IT work product.	✓	✓	✓	✓	✓	✓
Reports. What are the specifications of the reports that are to be generated by business information systems and/or DBMS ad hoc query language or package report writers. What are the various view columns or directly connected database columns involved in the database?			✓	✓		
Requirements: What are the requirements that in total support the development of key enterprise database components? How these requirements are interrelated, subdivided, and then related to the various metadata components that are “required” as a consequence? How can the complete set of effects can be known and interrelated?	✓	✓	✓	✓	✓	✓
Resource Life Cycles: What are the key Resources (facilities, materiel, staff, etc.)?How are they sequenced, interrelated, and how are they supported through databases and information systems?		✓	✓			



Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
Specified Model: <i>What are the data model specifications that represent concepts that are to be included in database models? What are the data elements that are represented as subject-entity-attributes across the specified concept data models? What are the various attribute-bound value domains, data integrity processes, and data types that are an implementation of various data elements?</i>		✓				
Use Cases: <i>What are the detailed business process scenarios required to accomplish the necessary work of the enterprise? What are the interrelationships among use cases? How are the use cases subdivided into certain events? What are the pre-, post-, and special-conditions of these use cases? What are the business facts that are read, selected, updated, and reported within use cases? What are the relationships between use case facts and database view columns?</i>	✓	✓	✓	✓	✓	✓
User Acceptance Tests: <i>What are the requirements-based accepted tests deemed appropriate and necessary to determine the adequacy of a business information system before it is released? What are the requirements that are being validated as being completed? What are the business information system components that are being tested?</i>		✓	✓			



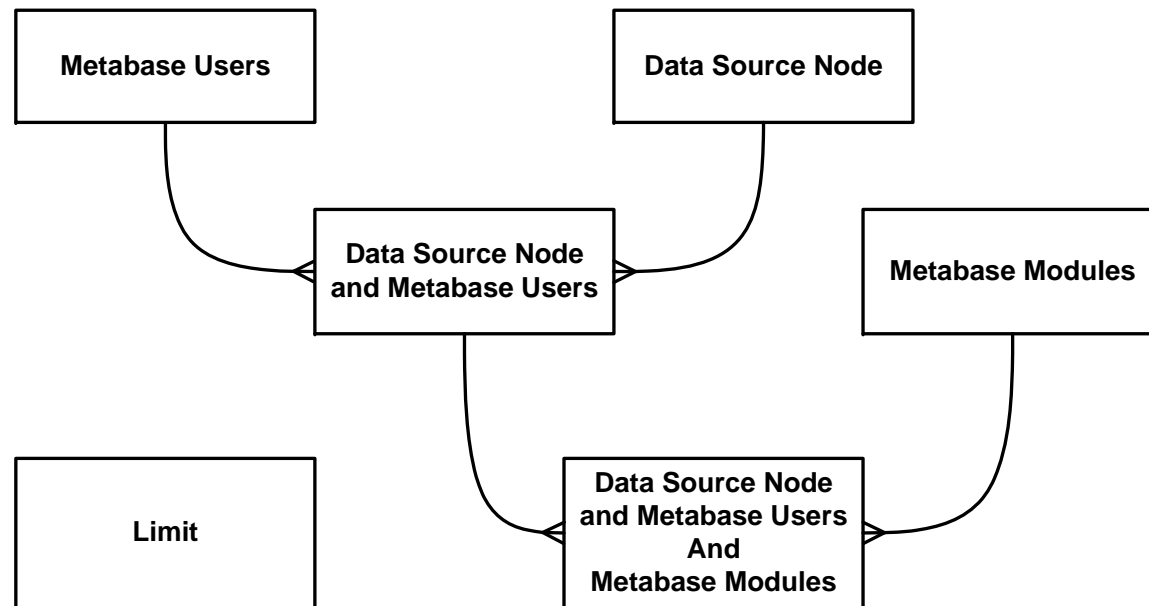
Business Questions Addressed by the Metabase Modules Within the Knowledge Worker Framework						
	Knowledge Worker Framework Columns					
	Mission	Database Objects	Business Information Systems	Business Event	Business Function	Business Organization
Metabase Software Module Scope						
View Model: <i>What are the data interface specifications between databases and business information systems? What are the various business information systems that are supported by specific databases? What are the various databases that are accessed by business information systems. What are the data-based mappings between views that support database interoperability? What are the data-based processes that transform data via one view to the data specifications of a different view?</i>		✓	✓			
Wire Frames: <i>What are the end-user graphical user interface specifications that enable end-users to interact with business information systems for data entry, formatted reports, ad hoc reporting, and for navigating through defined features of the business information systems? What are the various screens that are affected by specific view-column database interfaces with business information systems? What are the various processes that affect either the data presented through the wire frames or are stored in the databases? What are the various controls and invoked processes evident through the wire frames?</i>		✓	✓			



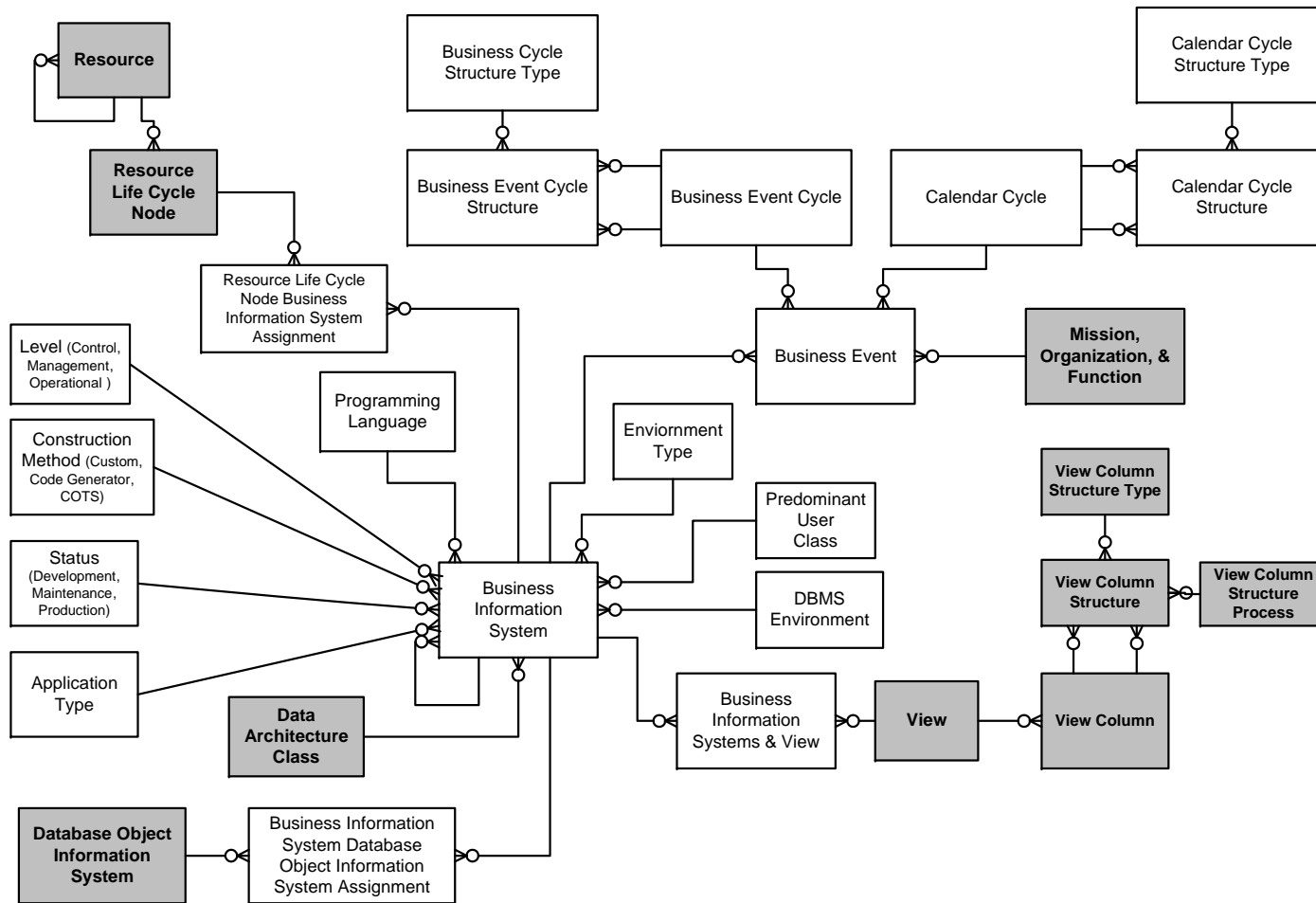
Metabase Meta Models

- Administrative Management
- Business Information Systems
- Database Objects
- Data Elements
- Data Integrity Rule: Specification
- Data Integrity Rules: Binding
- Document and Form
- Governance
- Implemented Data Model
- Information Needs Analysis
- Mission Organization, Function, and Position
- Operational Data Model
- Project Management
- Reports
- Requirements Management
- Resource Life Cycle Analysis
- Specified Data Model
- Use Cases
- User Acceptance Tests
- View Data Model
- Wire Frames





Business Information Systems

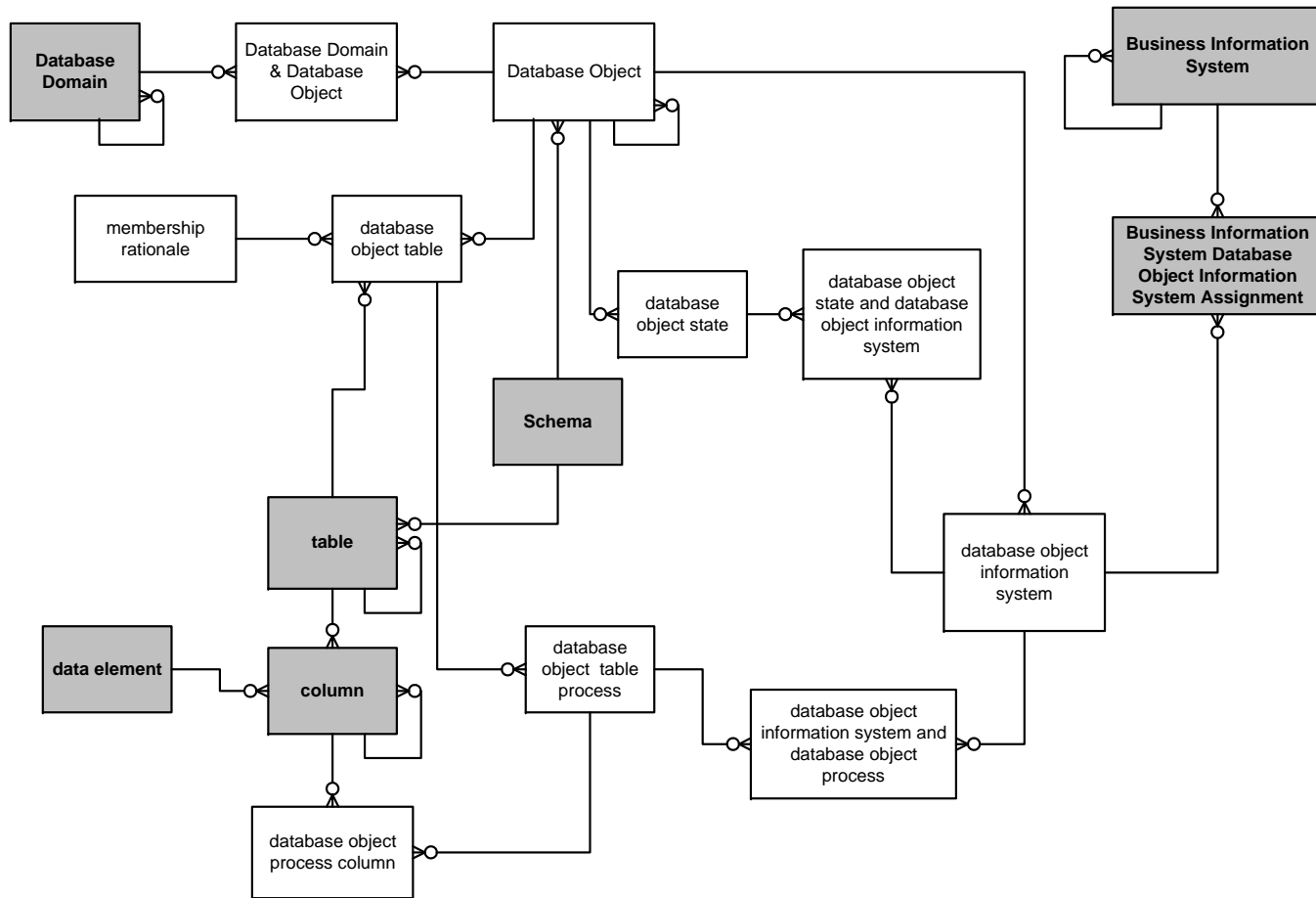


Business Information Systems

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Database Objects

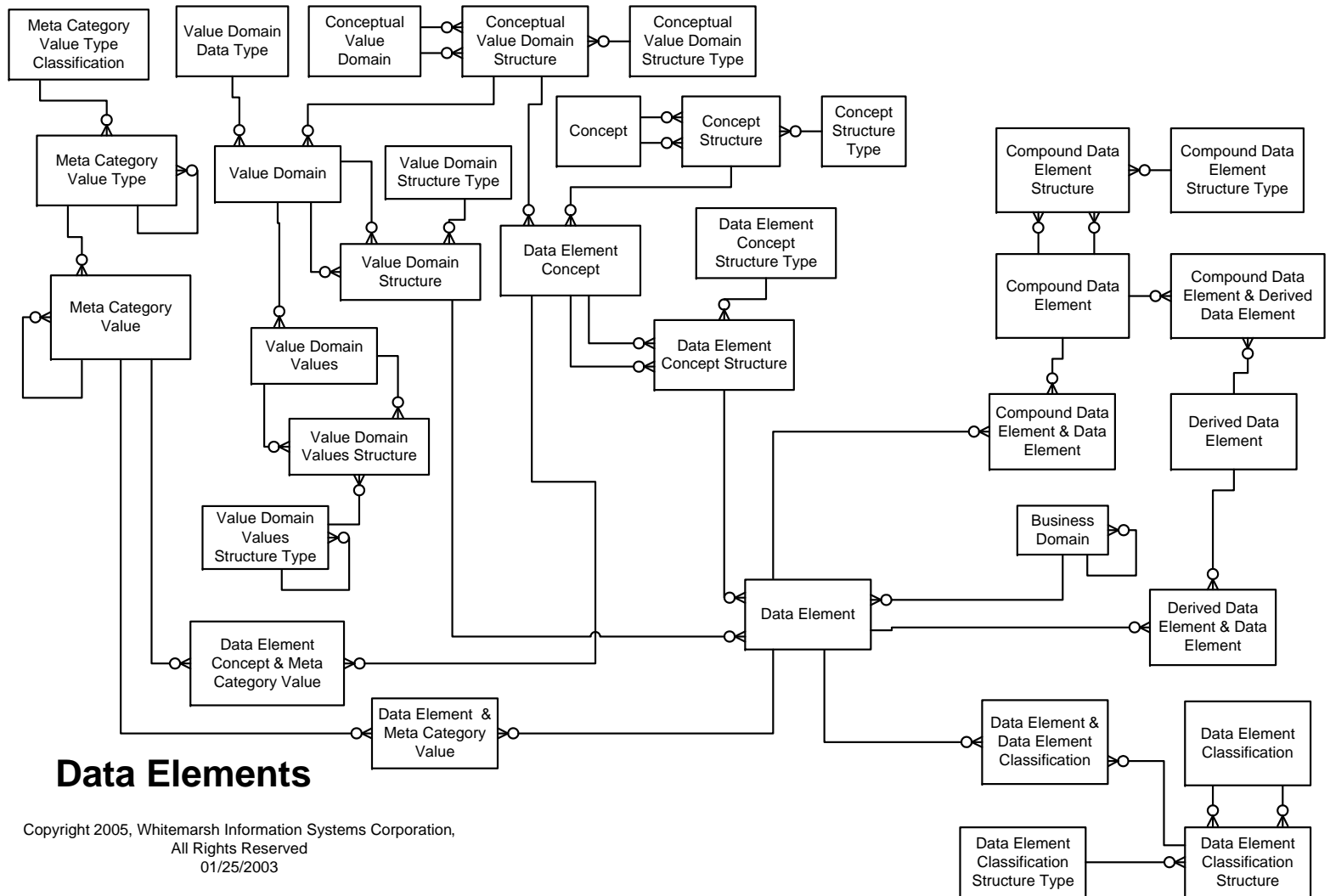


Database Objects

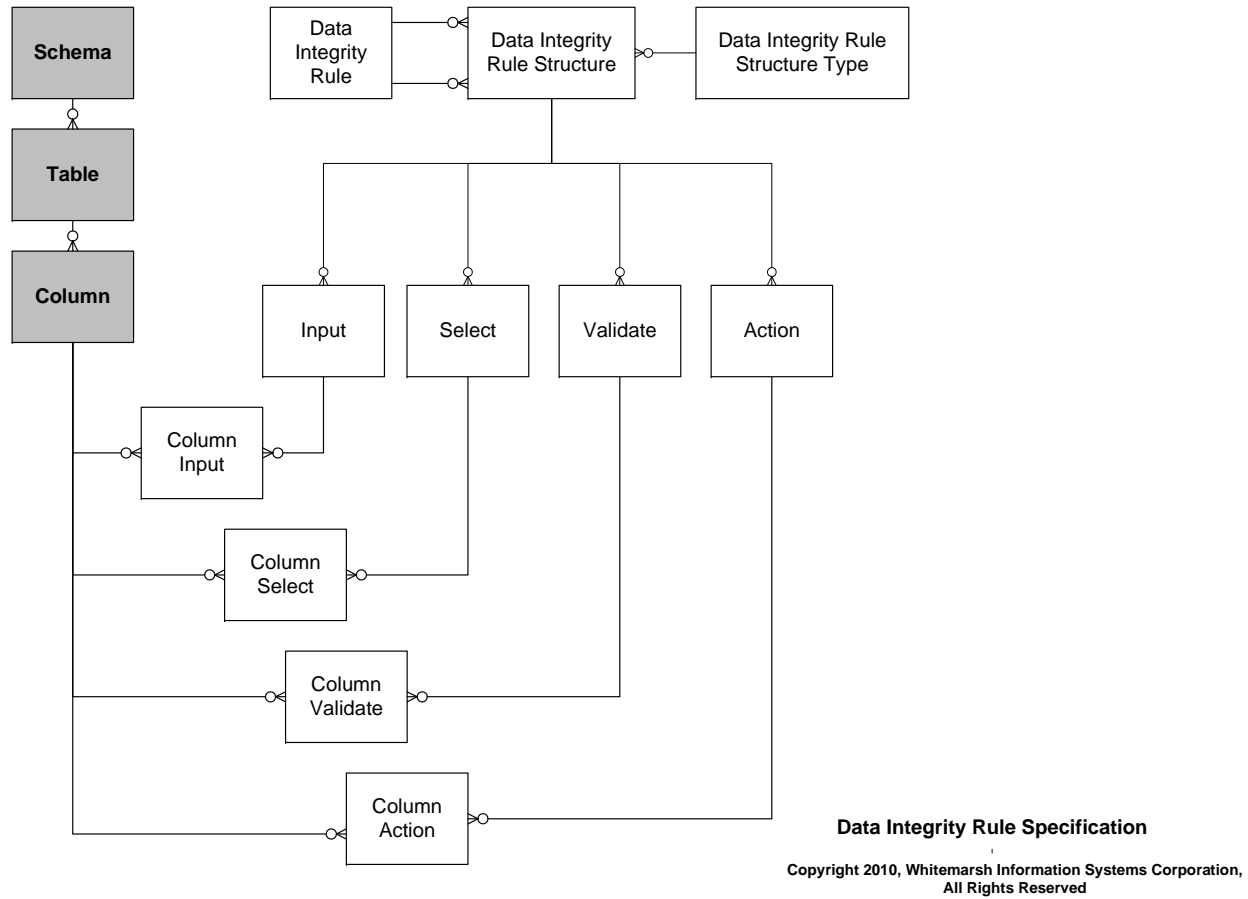
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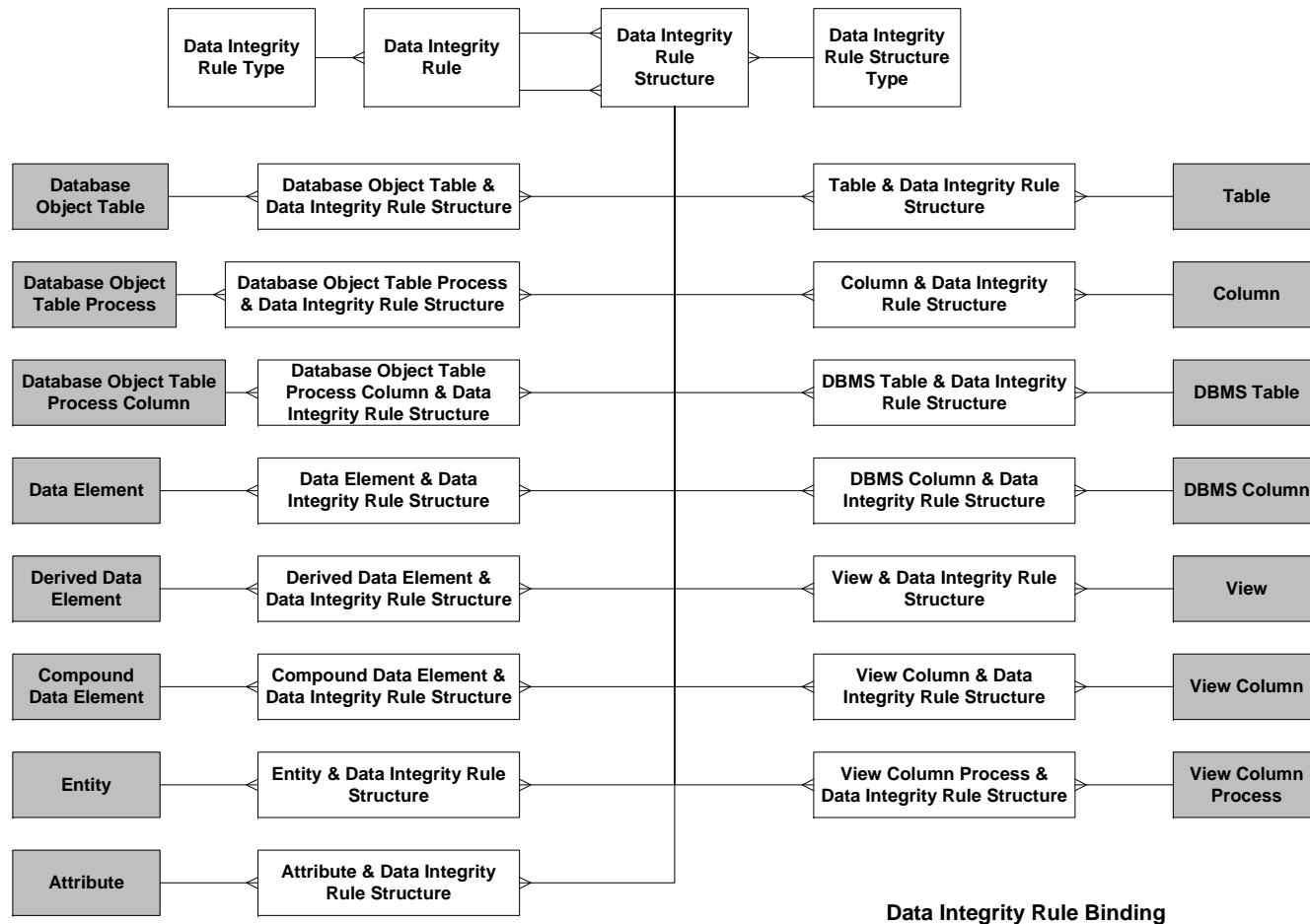
Data Elements



Data Integrity Rule: Specification



Data Integrity Rules: Binding

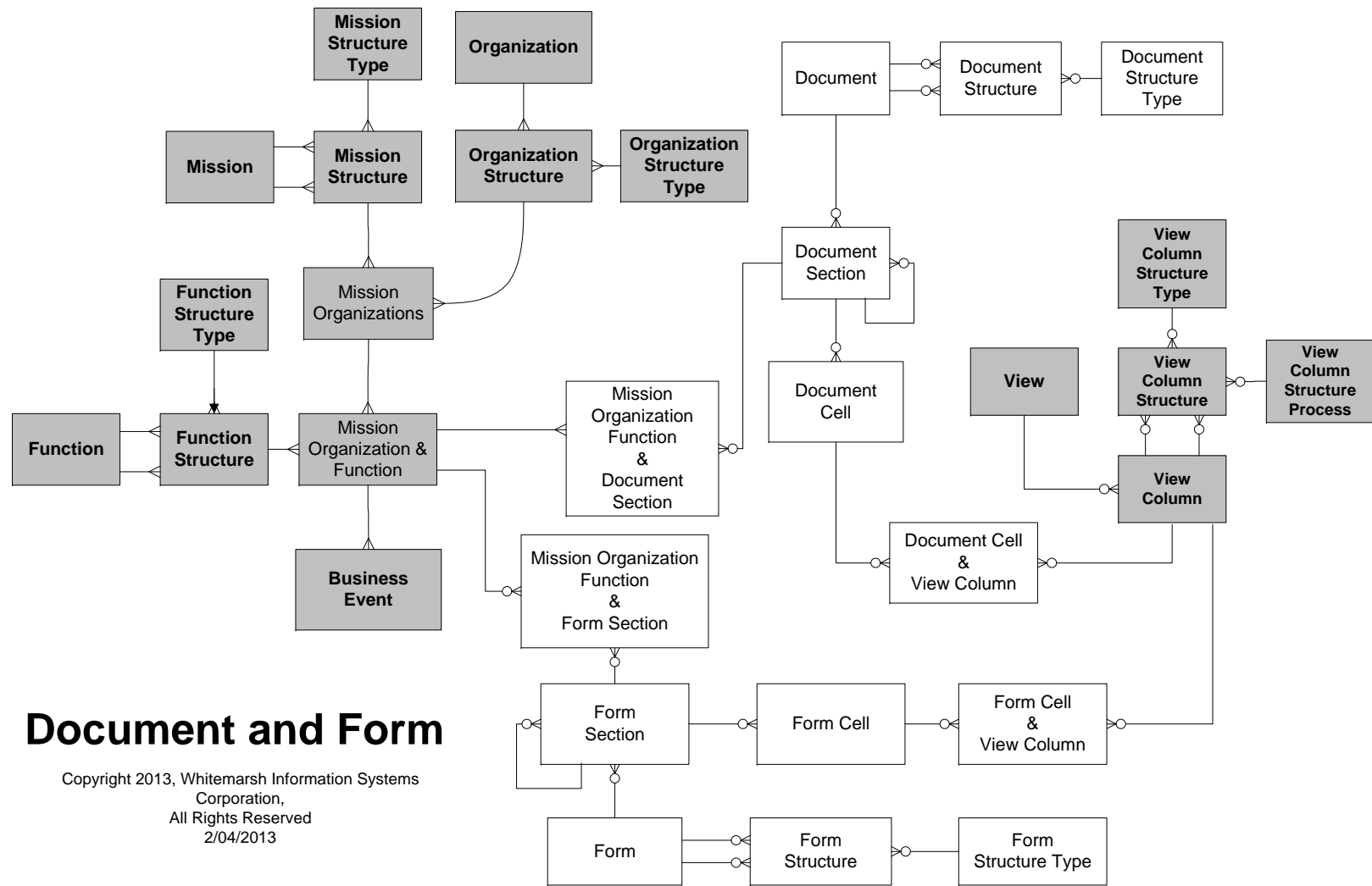


Data Integrity Rule Binding

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Document and Form

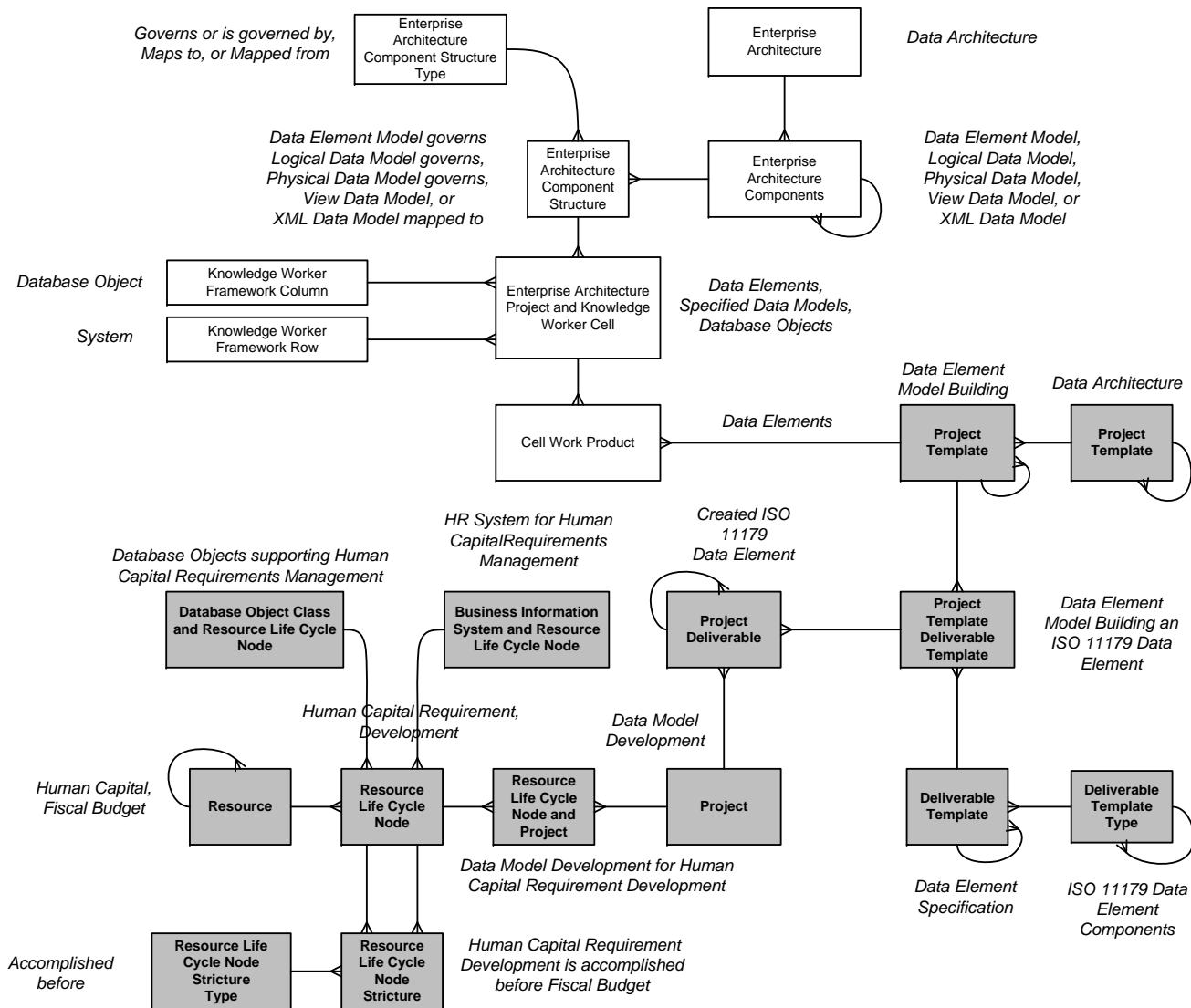


Document and Form

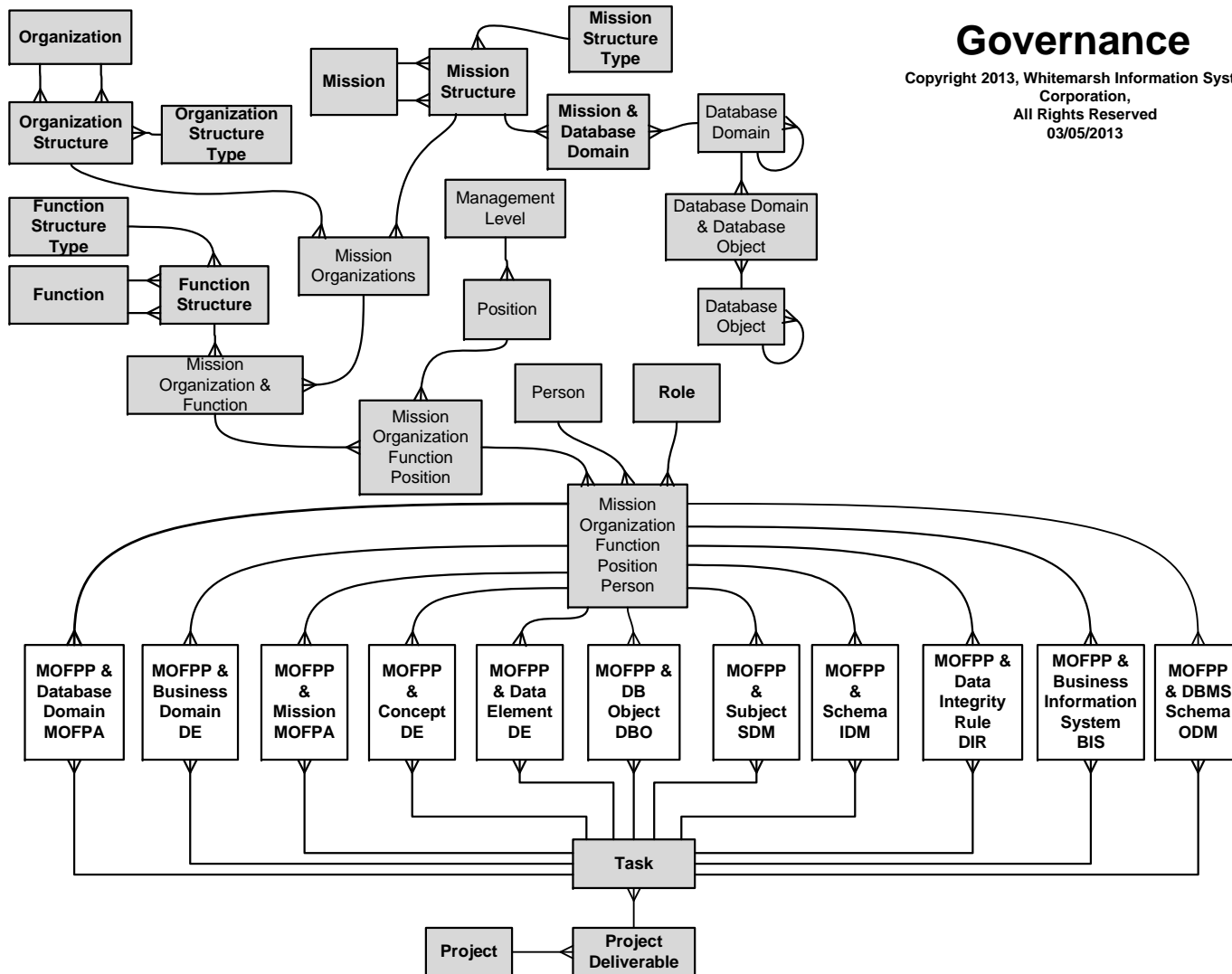
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Enterprise Architecture Management



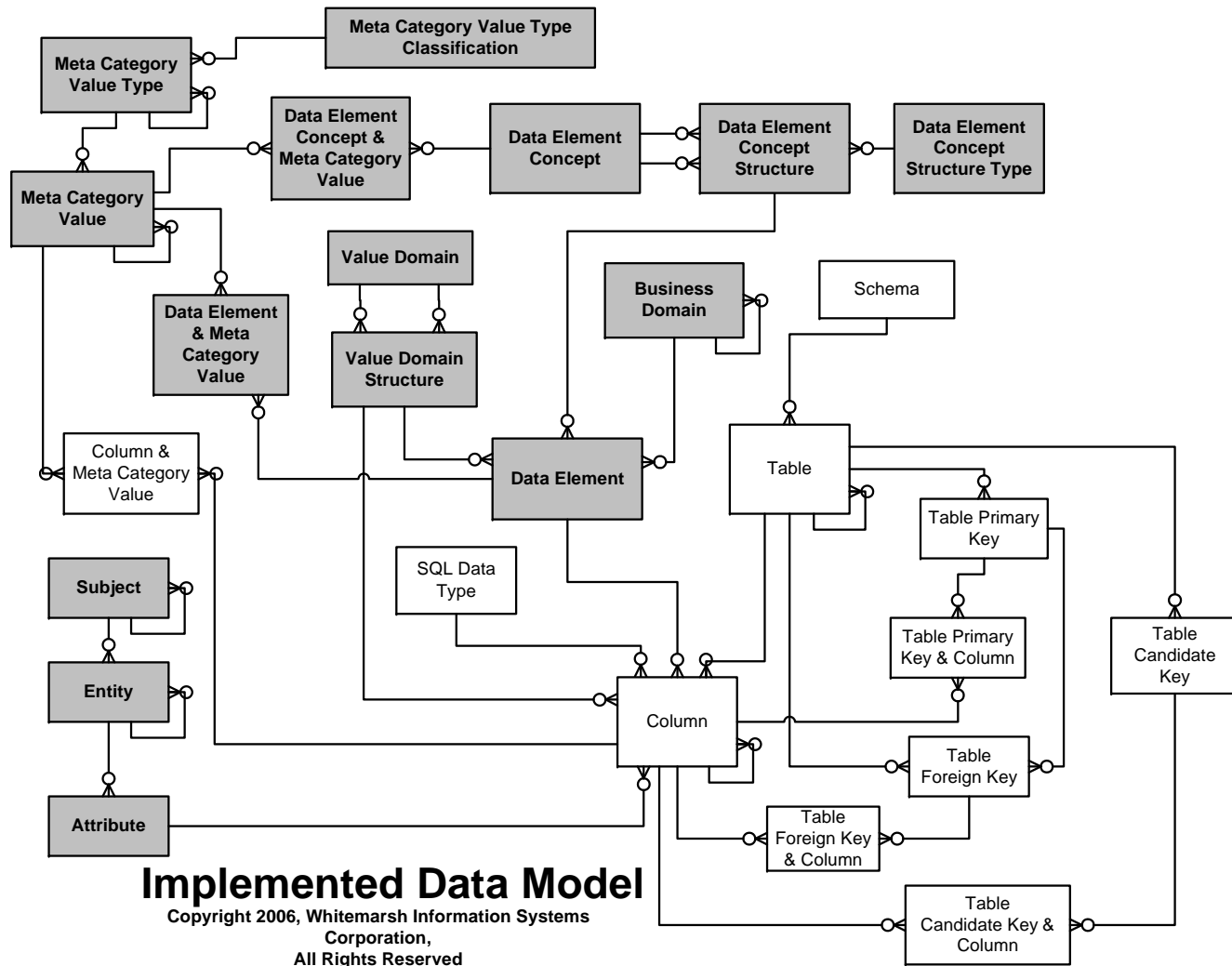
Governance



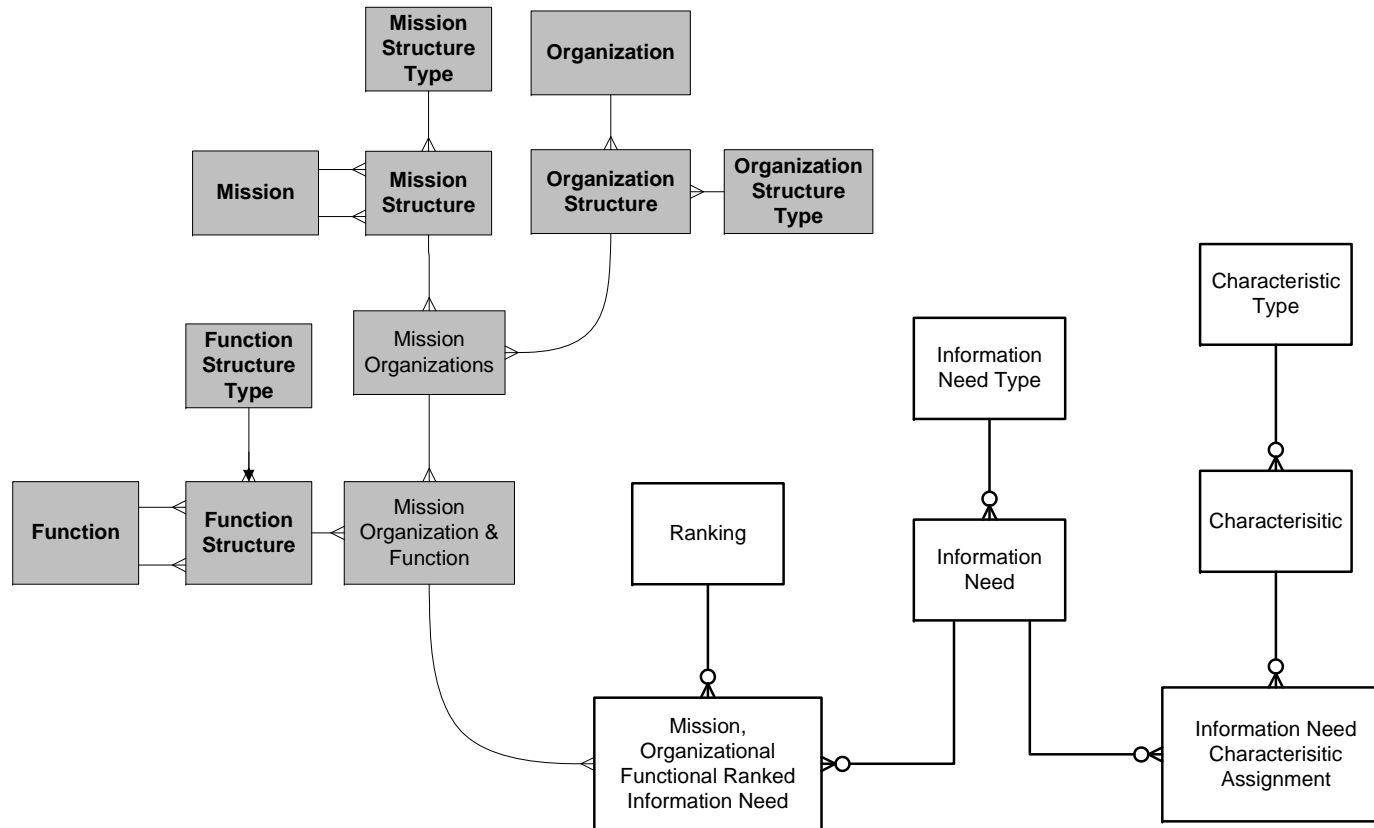
Governance
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Implemented Data Model



Information Needs Analysis

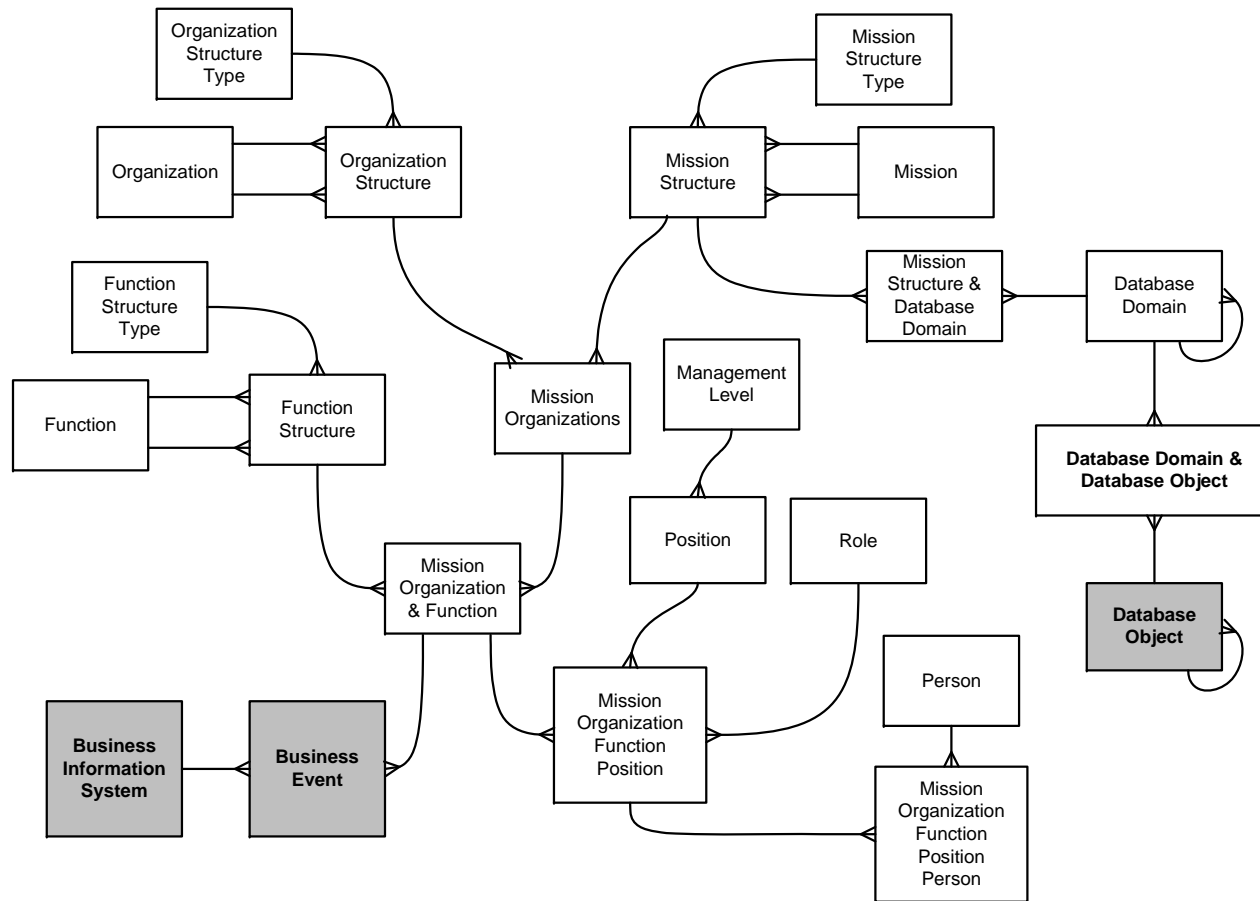


Information Needs Analysis

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Mission Organization, Function, and Position

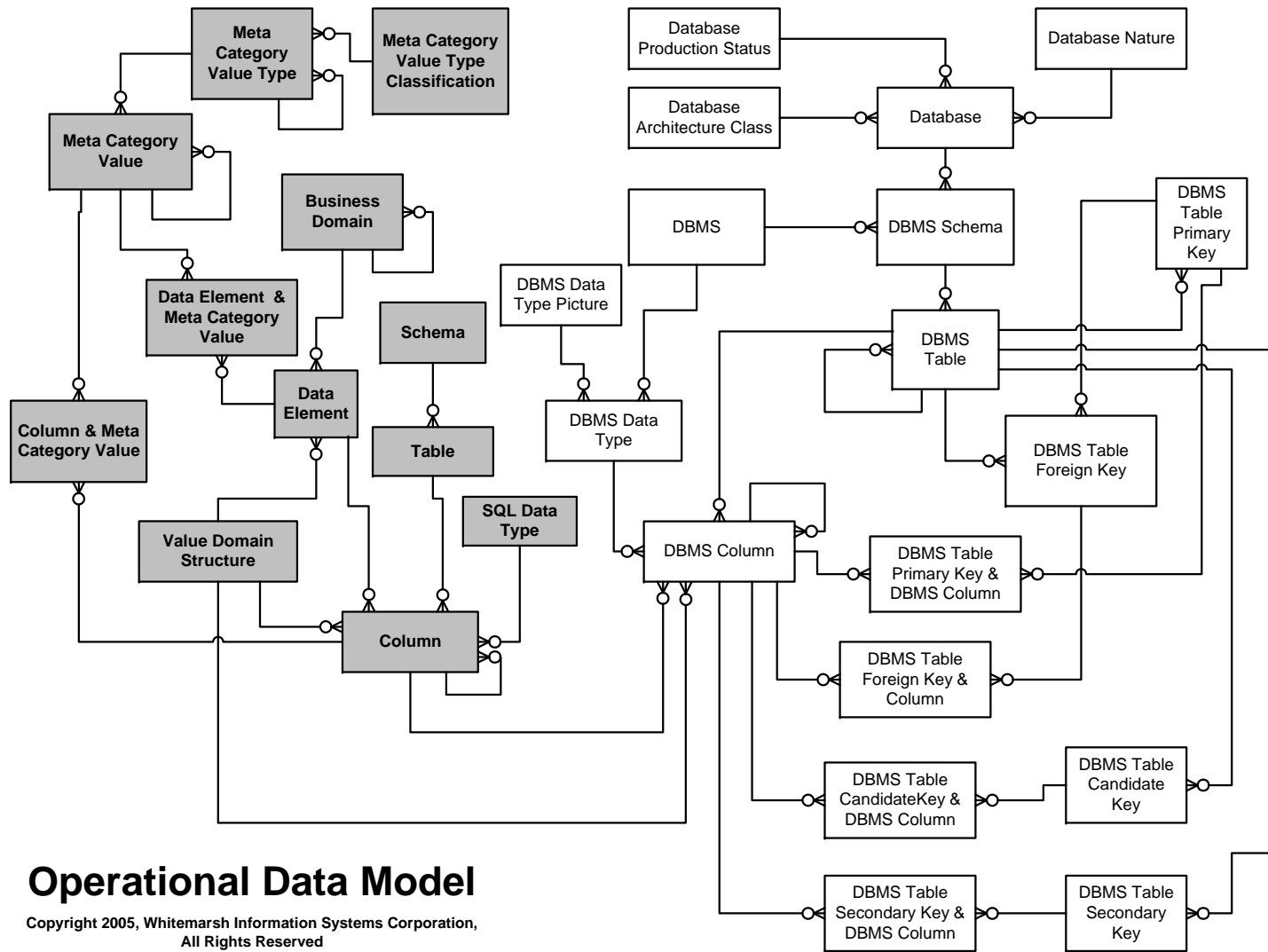


Mission, Organization, Function, Position

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Operational Data Model

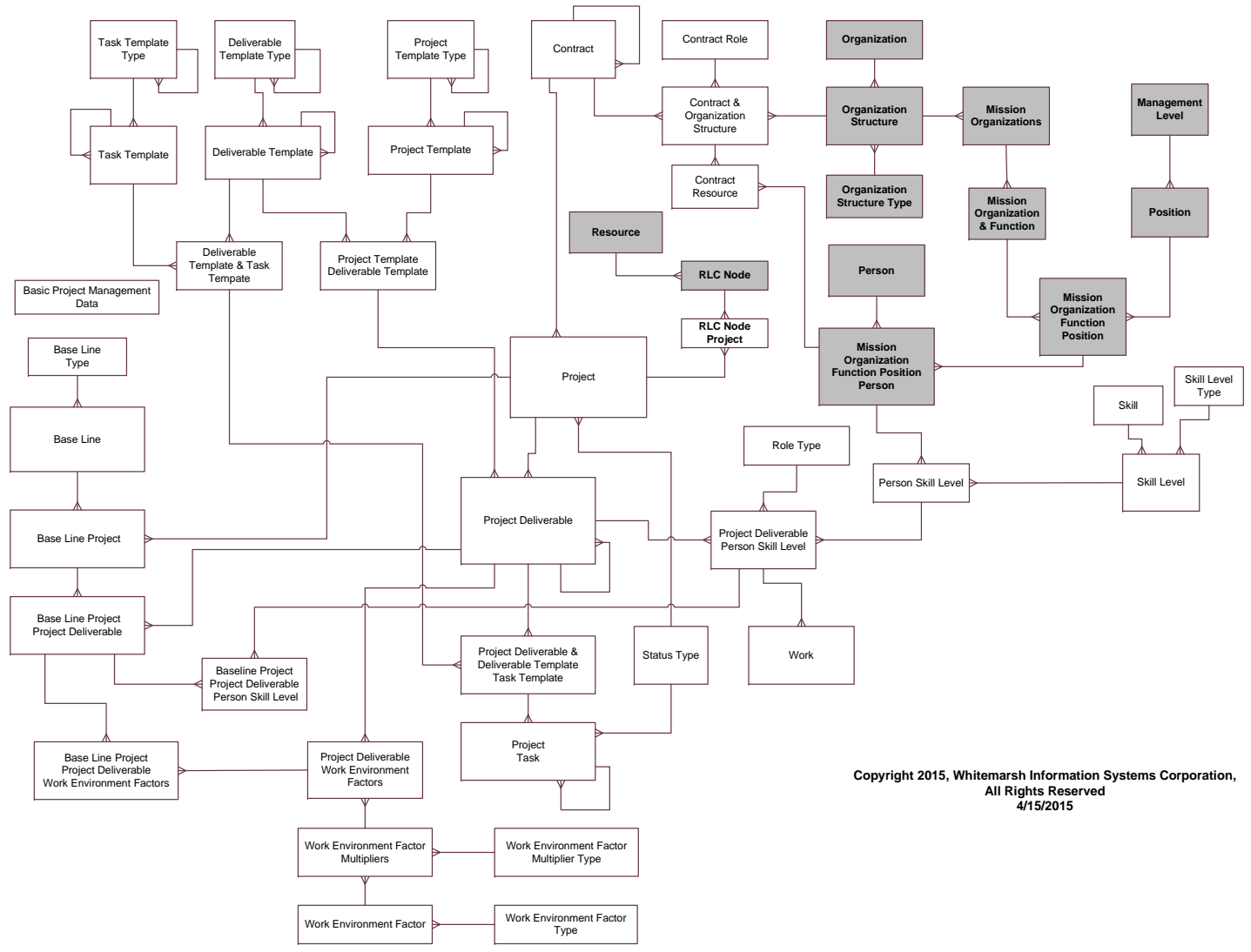


Operational Data Model

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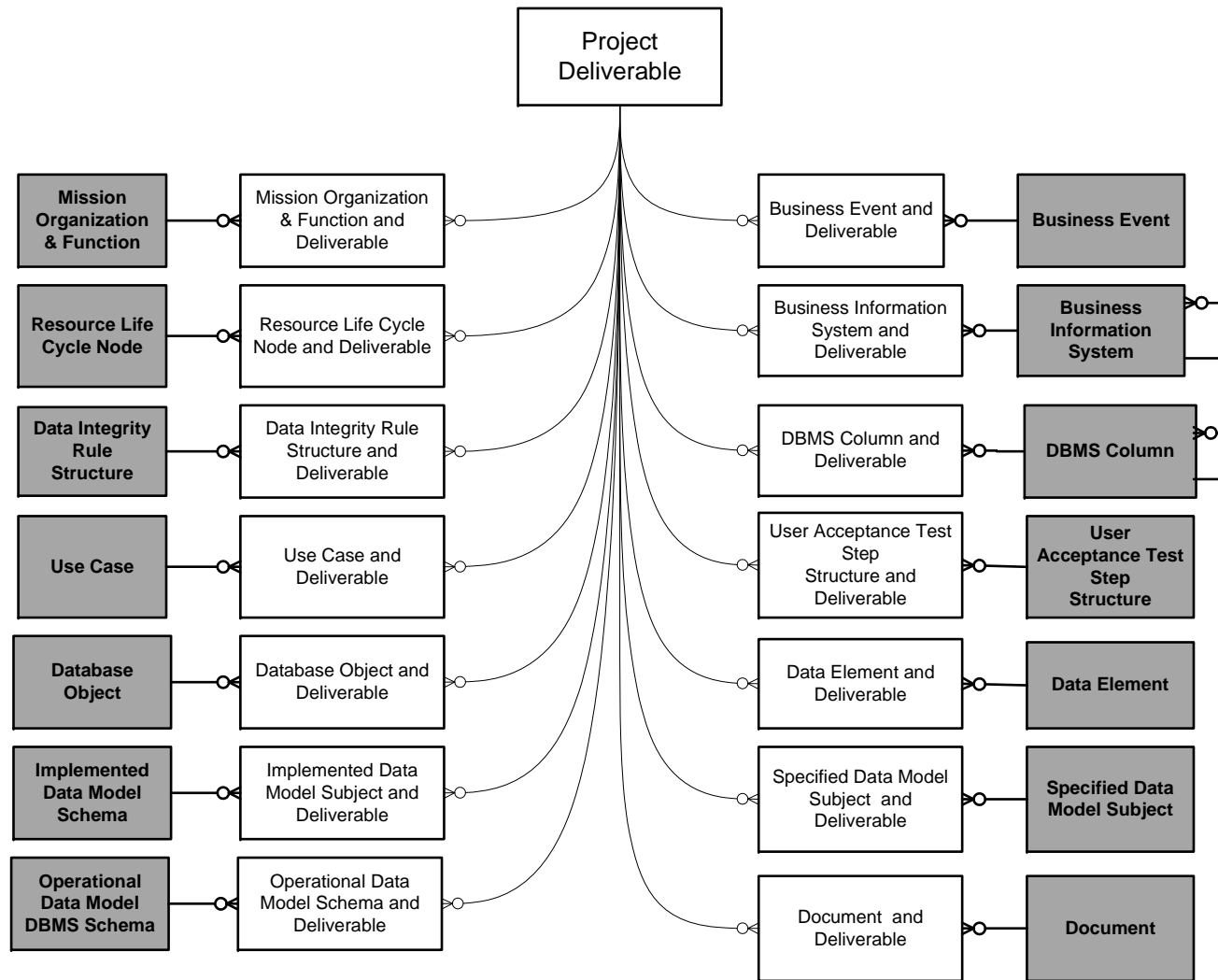
Project Management



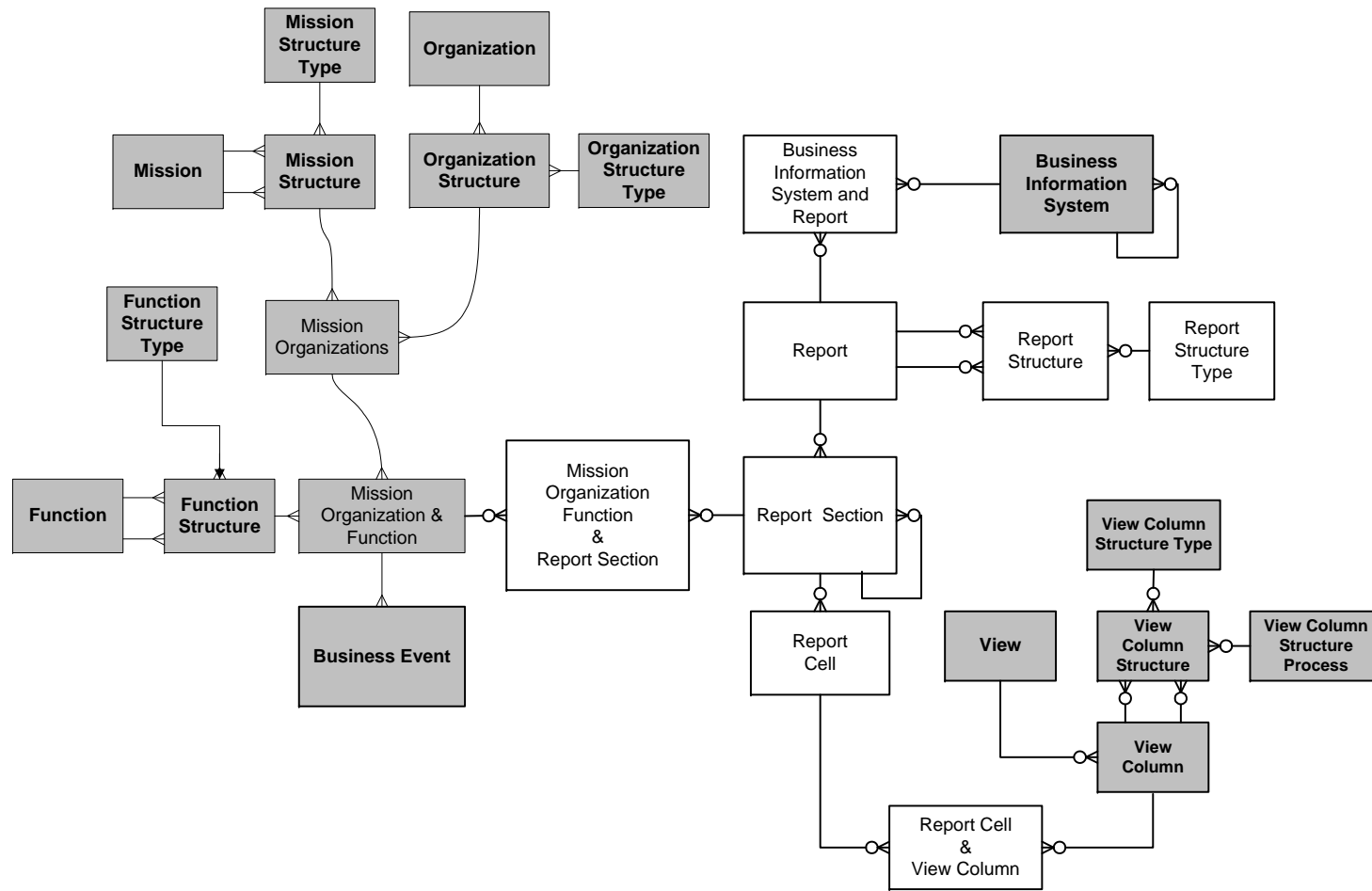
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Project Management (cont.)



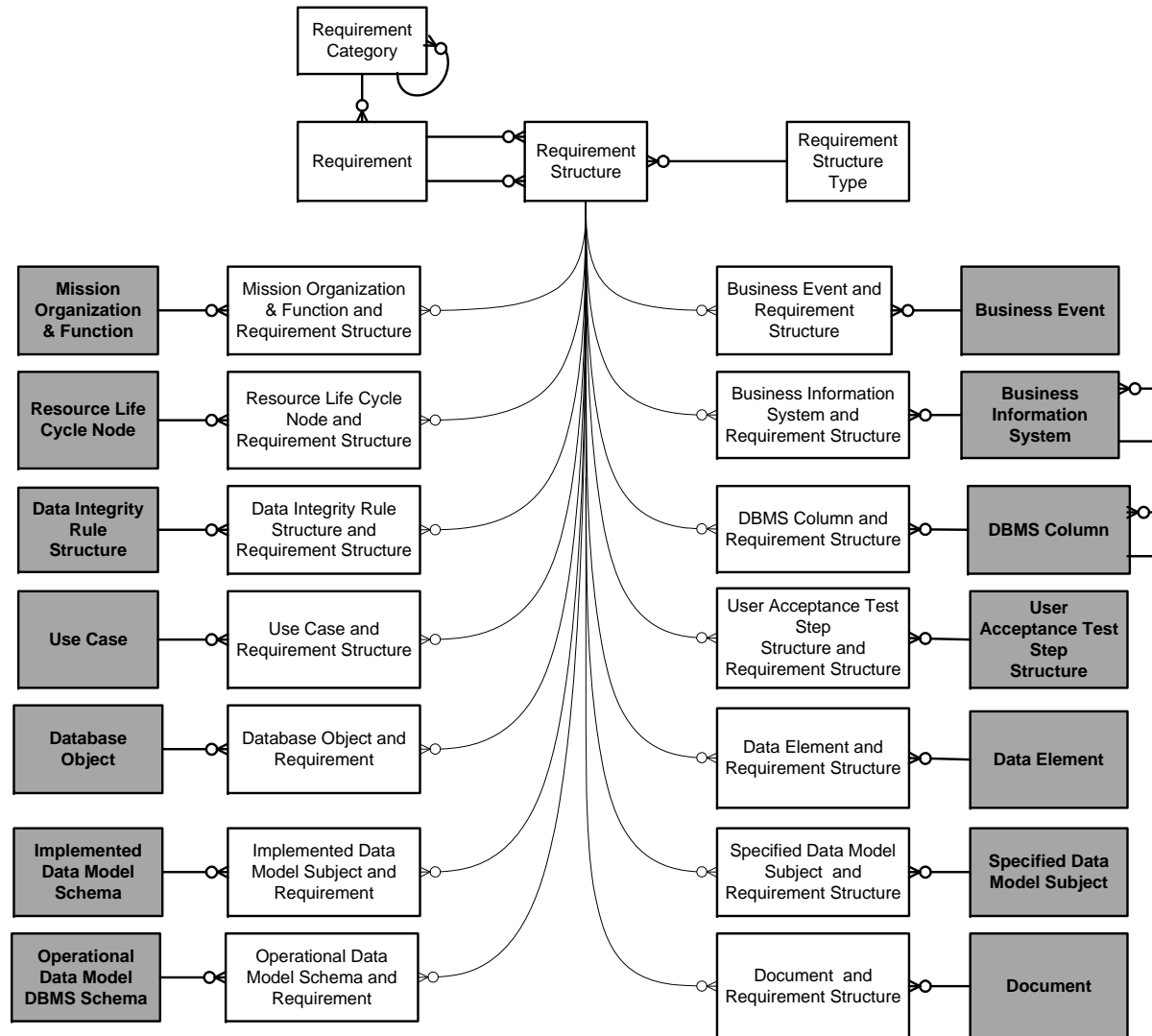
Reports Management



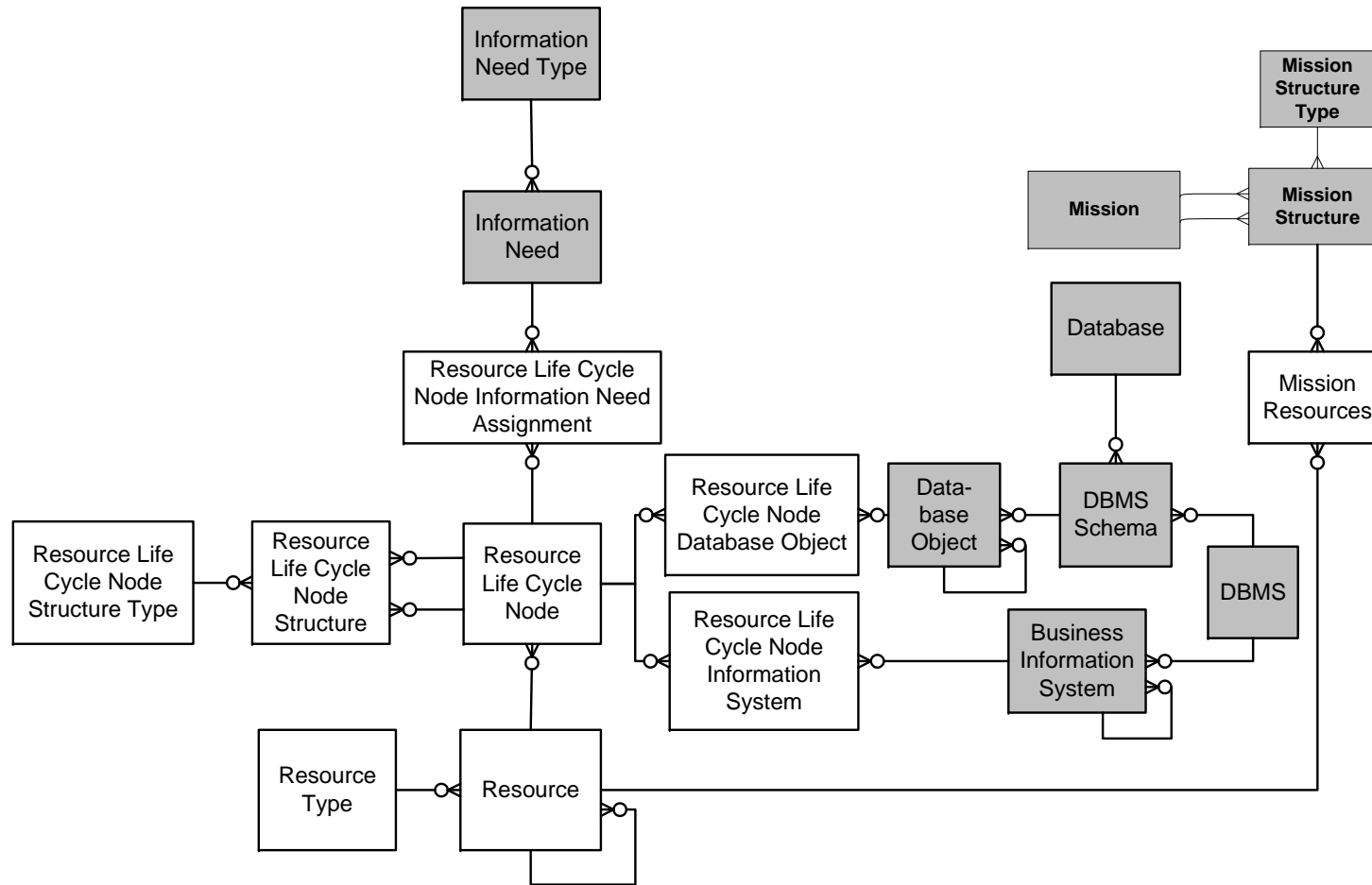
Reports Management

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Resource Life Cycle Analysis

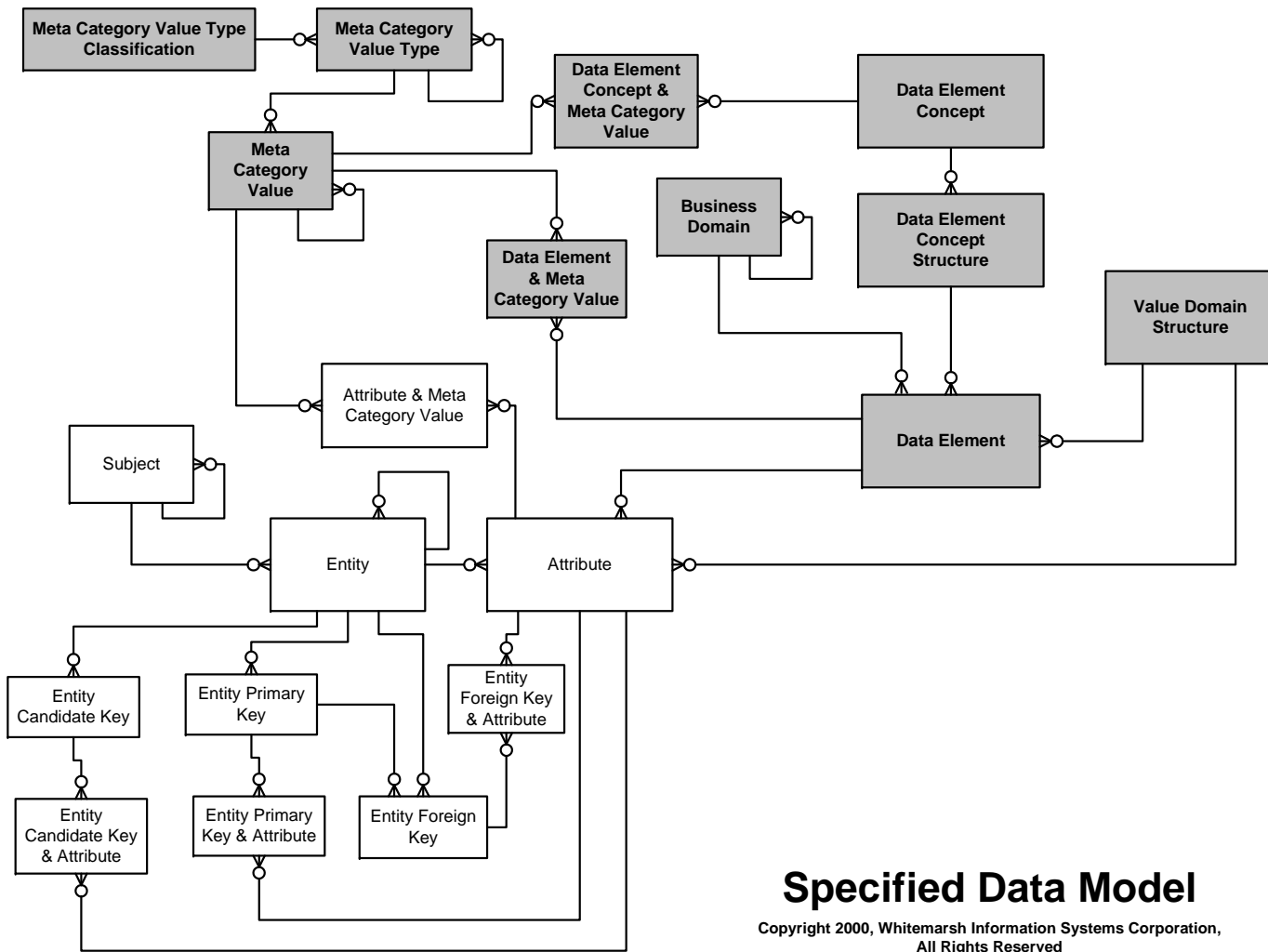


Resource Life Cycle Analysis

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Specified Data Model

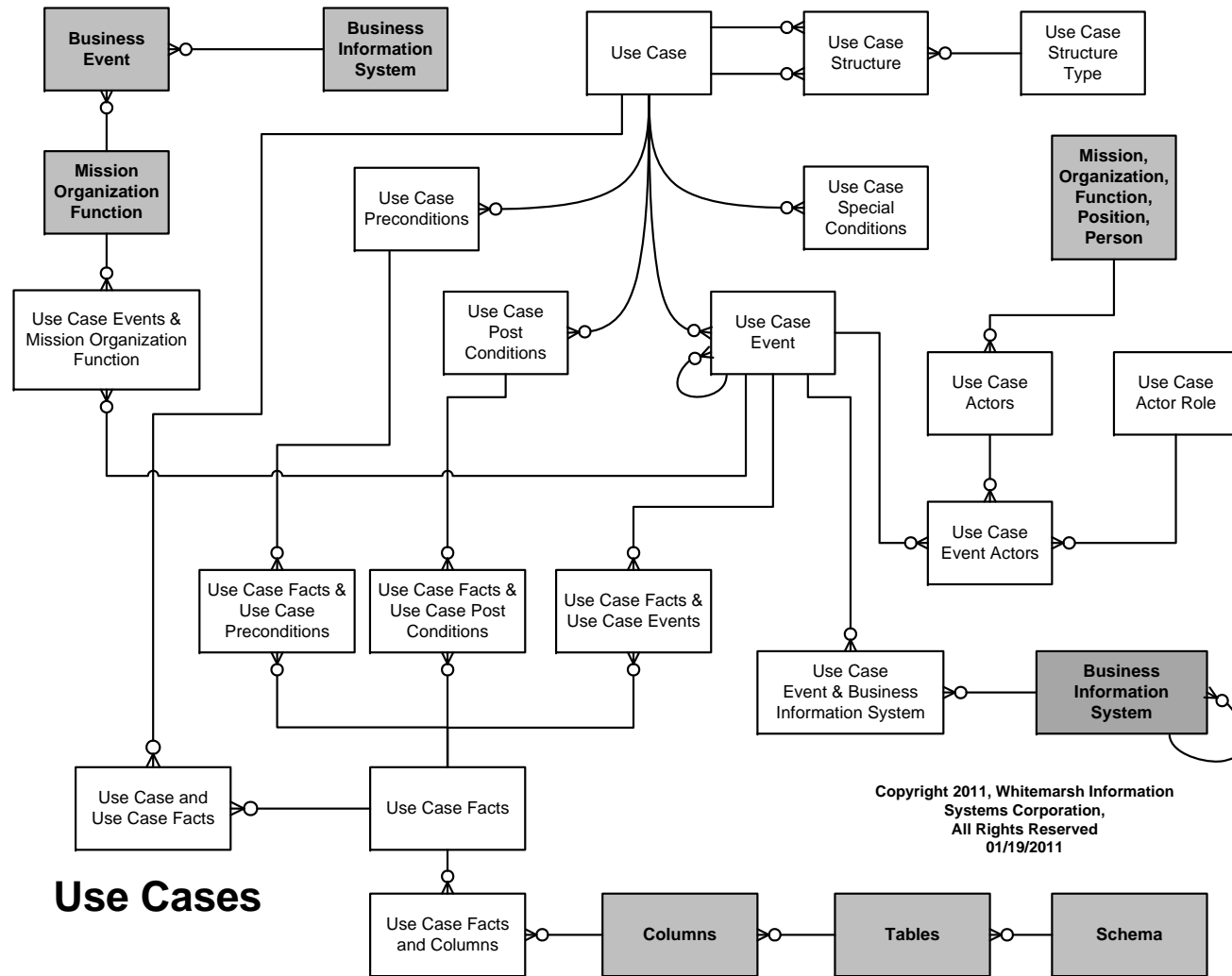


Specified Data Model

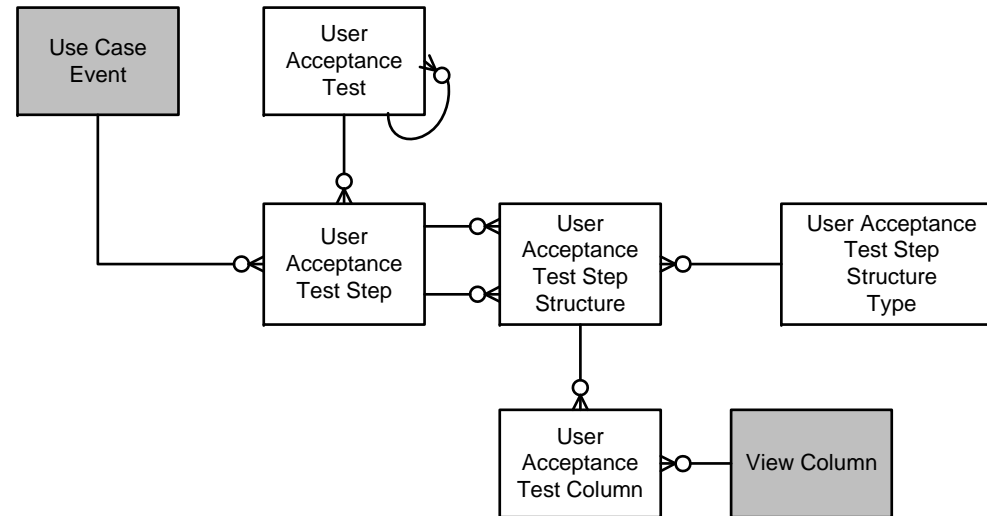
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Use Cases



User Acceptance Tests

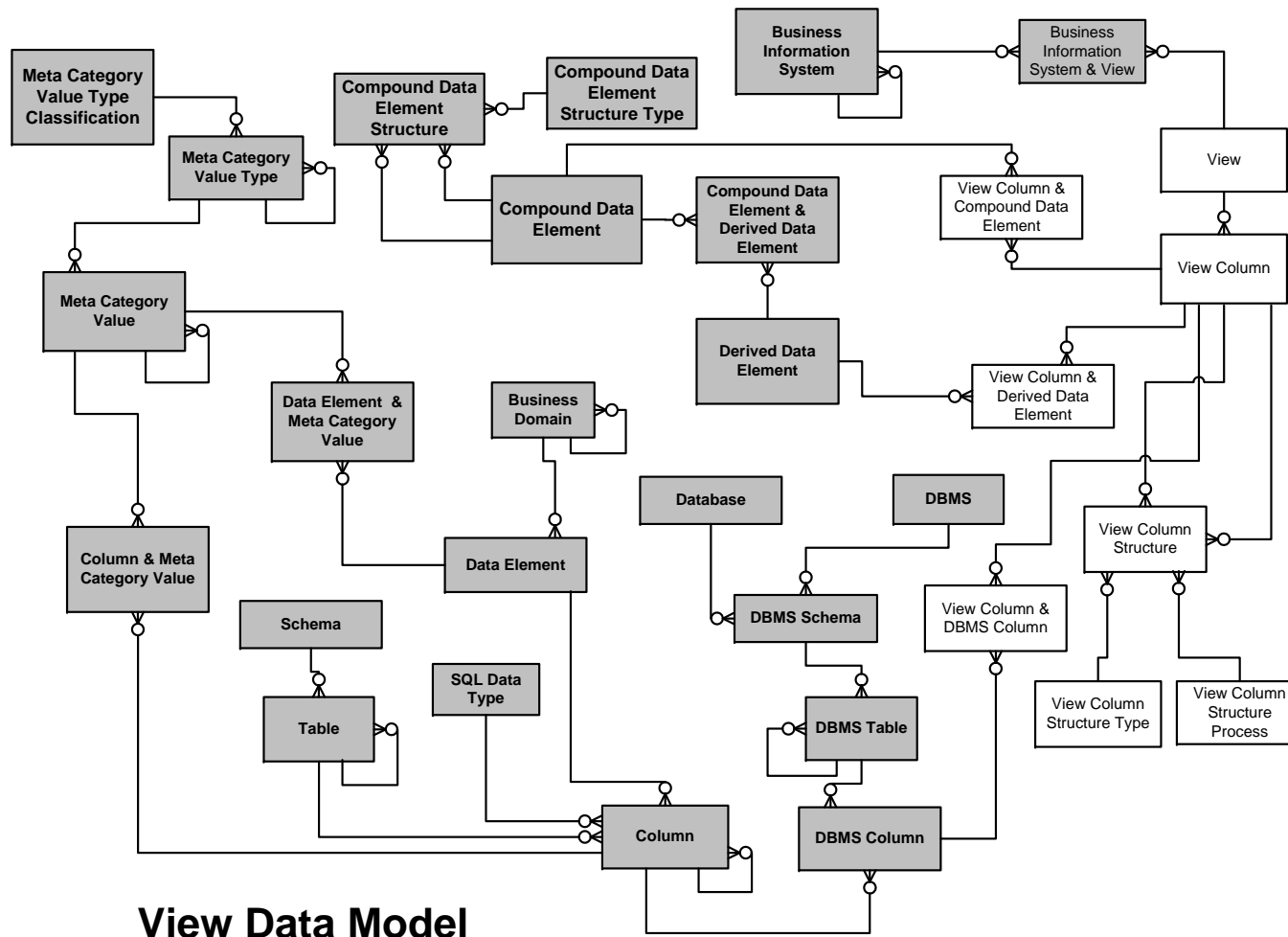


User Acceptance Tests

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View Data Model

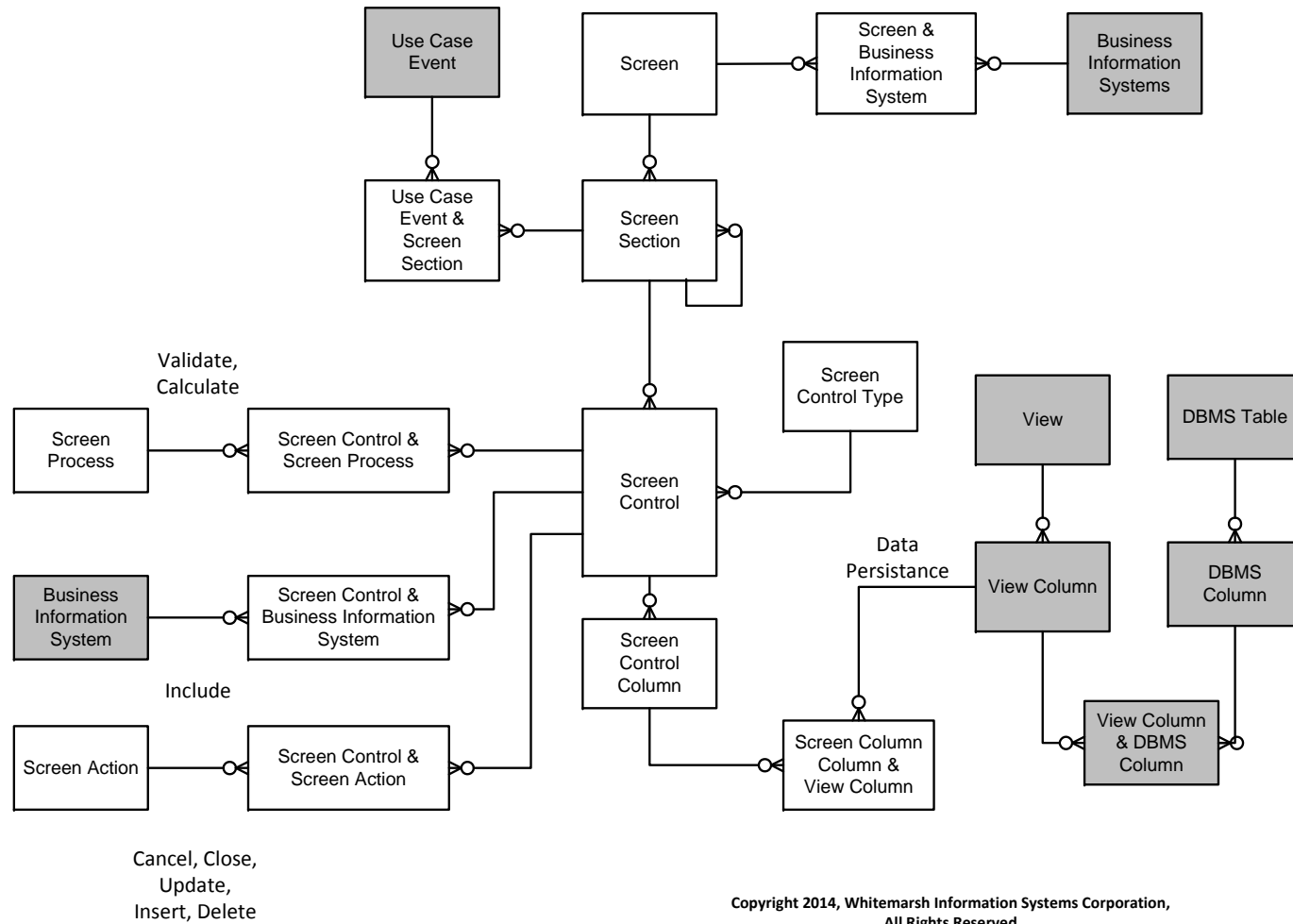


View Data Model

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Screens



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Metabase Overview, Meta Model Entity Relationship Diagrams, and the Knowledge Worker Framework

1. Metabase is a term crafted from “metadata database.” The term, metabase, has been used by Whitemarsh since 1981 in reference to the many different metadata database systems that Whitemarsh has built for its clients. These metabases have been built in Information Builder’s Focus, CA’s IDMS, .Cincom’s Total, and SoftVelocity Corporation’s Clarion for Windows.

