FSA Integration Partner

United States Department of Education

Federal Student Aid

Data Strategy 2.0
Technical Strategies
152.1.4a Data Strategy Target Vision
Enterprise Analytics Architecture Option Analysis Draft

Task Order #152

Version 1.0

February 27, 2004

Note: This deliverable is a working outline intended to validate the high-level approach for the Enterprise Analytics Architecture Option Analysis effort. Results of the analysis will be detailed in the final deliverable, 152.1.4b "Data Strategy Target Vision Enterprise Analytics Architecture Option Analysis," due 9/30/2004.

Executive Summary

In the final version of this document (152.1.4b due September 30, 2004), the Executive Summary will provide an overview of the document's content as well as a summarization of any key messages. The intended audience for the executive summary will be those readers that wish to obtain a high-level insight into the key findings discussed throughout this options analysis.

Amendment History

DATE	SECTION/ PAGE	DESCRIPTION	REQUESTED BY	MADE BY
02/27/04	All	Document submitted for FSA-wide review.	N/A	M. Quarles

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Figures and Tables

1 Introduction

1.1 Purpose

The purpose of this document is to provide a structural outline and layout the approach for an analysis of enterprise analytics architecture options that will take place in the coming months. The Enterprise Analytics Architecture Option Analysis will be delivered in two phases:

- **152.1.4a Data Strategy Target Vision Enterprise Analytics Architecture Option Analysis Draft –** The draft deliverable (this document) focuses on developing the high-level approach in outline form and providing the context upon which the final deliverable will be constructed. The sections of this deliverable serve as a means to show the approach for delivering the final options analysis. (due 2/29/04)
- **152.1.4b Data Strategy Target Vision Enterprise Analytics Architecture Option Analysis –** Using the outline developed in the first draft deliverable, the second deliverable will document the findings from FSA working sessions, detail the architecture options and provide an analysis of those options based on the business and technical considerations identified by key stakeholders. (due 9/30/04)

This document poses a series of sample questions surrounding the business and technical considerations that will help drive the architecture options analysis effort. The questions are a means to identify topics for discussion that will provide the input into creating the final deliverable (152.1.4b). These questions are not intended to be absolute and will be refined as necessary throughout the process.

1.2 Background

The Technical Strategies effort supporting the Data Strategy 2.0 task order expands upon the work completed under the Data Strategy 1.0 initiative. In the final deliverable (152.1.4b), this section will provide additional information on the background of the Data Strategy effort as well as describe more specifically what previous and ongoing initiatives within Data Strategy will contribute to the architecture options analysis.

The final architecture options analysis will build upon the high-level vision created in the initial Data Strategy Target Vision. In 152.1.4b this section will briefly outline some of the precursors to Data Strategy 2.0 that led to its inception and task order creation, as well as provide some of the context for why FSA needs to further review Enterprise Analytics Architecture options.

1.3 Scope

In 152.1.4b this section will provide a brief description of the goals of the document and the scope of work completed to support the option analysis.

1.4 Approach

In order to understand the business and technical considerations that apply to FSA's analytical and research needs, a series of working sessions will be conducted with business owners and program support personnel. The purpose of these meetings will be to collect information related to the current state and identify areas where FSA's analytical needs can be better supported by changes to the enterprise architecture.

In addition to the working session group, a "Program Services Group" has been identified to help provide supplementary feedback to this effort. The Program Services Group will participate in this effort by submitting responses to email inquiries and questionnaires, reviewing deliverable drafts and submissions, and providing feedback to FSA leadership. This approach will allow for a larger breadth of FSA participation and business area representation.

1.5 Assumptions

Any assumptions captured during the creation of the architecture options and supporting analysis will be captured in this section. Any assumptions related to previous and ongoing initiatives at FSA will be factored into the option analyses of deliverable 152.1.4b and highlighted in this section.

1.6 Alignment with FSA's Strategic Objectives

152.1.4b will identify the areas in which the Enterprise Analytics and Research Business Capability area supports FSA's Strategic Objectives and other enterprise-wide initiatives. The following items are FSA's Strategic Objectives for Fiscal Year 2004:

1. Integrate FSA systems and provide new technology solutions
2. Improve program integrity
3. Reduce program administrative costs
4. Improve human capital management
5. Improve products and services to provide better customer service
6. Deliver student aid effectively and accurately

2 Enterprise Analytics and Research Business Capability Area

2.1 Background

Enterprise Analytics and Research is one business capability area that was identified in the Data Strategy 1.0 Data Framework Specification (123.1.4). The Business Capability Areas are intended to group FSA's work into logical organization units. They include one or many cross-functional systems that take advantage of commonalities and reuse resources for similar business functions. These units are comprised of similar business process steps that use much of the same process logic and data.

As a precursor to the options analysis, some additional background will be necessary to provide the context for the planned discussions of architecture options. The 152.1.4b deliverable will briefly discuss the achievements already accomplished with the initial Data Strategy effort and highlight the items related to enterprise analytics that required further review. This section will also discuss how Enterprise Analytics and Research (EA&R) is a cross-lifecycle business capability area and the dependencies that are associated with that role.

As part of Data Strategy 1.0, FSA created the next generation of the Financial Aid Life Cycle Diagram (Figure 1) to illustrate the target state vision. This diagram provides an enterprise-wide data flow synopsis and a view which depicts current FSA systems' functions as they relate to the future Business Capability Areas. Figure 1 highlights the Enterprise Analytics and Research Business Capability area's placement in the To-Be Financial Aid Lifecycle:

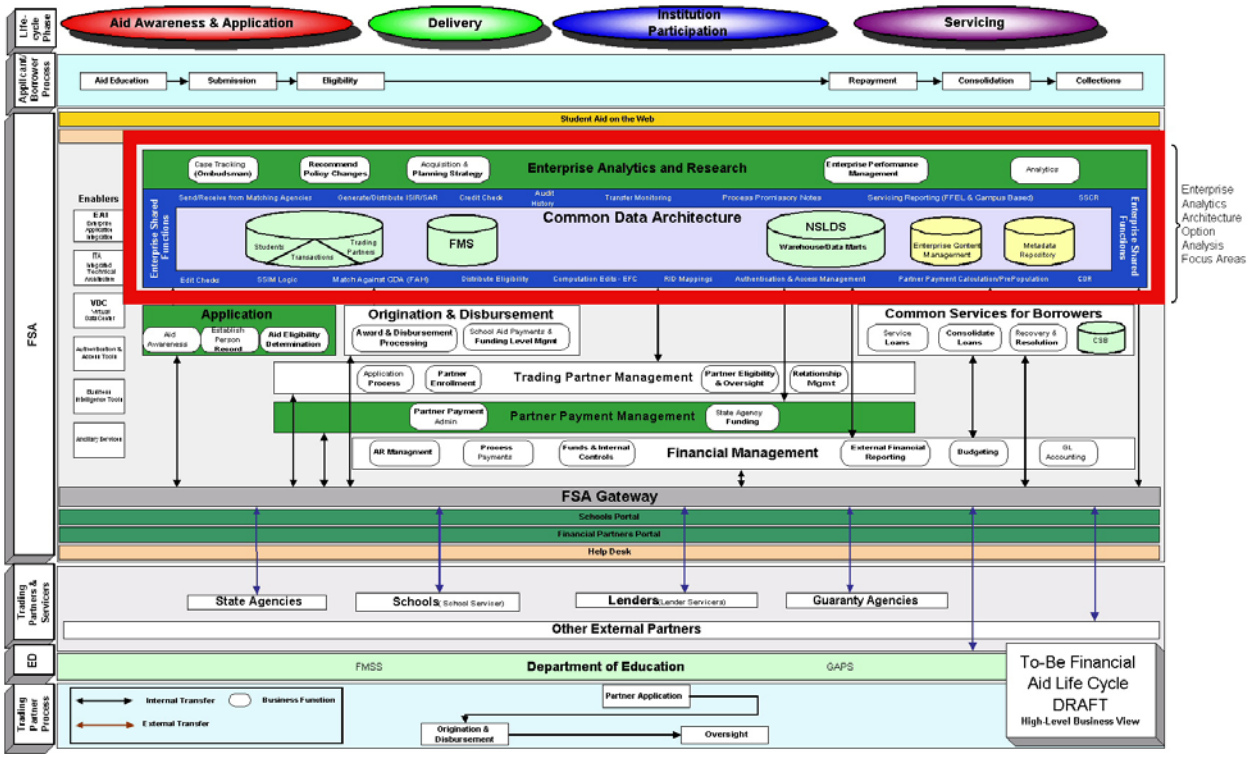

Figure 1 - To-Be Financial Aid Lifecycle

2.2 *Definition*

A high-level definition for the Enterprise Analytics and Research Business Capability Area was developed within the Data Framework Specification (123.1.4) of Data Strategy 1.0 and will be reviewed, validated and further defined jointly with key FSA stakeholders during Data Strategy 2.0. The description of the Enterprise Analytics and Research Business Capability area as defined by the Data Framework Specification is outlined below:

In the To-Be state, Enterprise Analytics and Research provides capabilities that are essential across the entire Financial Aid Life Cycle. EA&R delivers the Enterprise Dashboard and support for a number of other management functions for FSA, such as:

- Portfolio Management
- Default Management
- Risk Management
- Data Quality Management
- Enterprise Performance Management

The Enterprise Analytics and Research Business Capability Area uses central, consolidated data to create an integrated student view and school view. With these views, EA&R enhances the analytical capabilities currently provided by NSLDS and other systems by allowing FSA to

better perform comprehensive program analysis and comparative analysis at both the student and school level. These analytics help support more effective and informed decision making. For example, they may identify previously unknown trends in student and trading partners' Title IV participation, possibly prompting recommendations for policy changes.

The analytics that will be provided by EA&R are cross-business function as well as cross-enterprise and will help stream-line FSA's business processes. Oversight and eligibility triggers which previously required the labor intensive process of collecting data from various FSA systems will be executed seamlessly against a common data store. As part of the EA&R, Ombudsman case tracking will have access to an integrated student view which readily provides answers to research issues.

Table 1 identifies the extent to which the Data Strategy 1.0 effort defined the Target State Functions for the Enterprise Analytics and Research Business Capability Area. The areas within this table will be explored further in Data Strategy 2.0 through working sessions with FSA stakeholders and feedback gathered from key FSA personnel.

Business Capability Area	Enterprise Function Grouping	FSA Enterprise Functions	As-Is Mapping Key Internal System(s)
Enterprise Analytics and Research	Ombudsman Case Tracking	Research applicant/borrower issues	Ombudsman, NSLDS
	Recommend Policy Changes	Research data and make recommendations for policy changes	Various Systems
	Acquisition & Planning Strategy	Maintain Acquisition & Planning Strategy	Various Systems
	Enterprise Performance Management	Manage Enterprise Performance	Various Systems
	Analytics	Manage Portfolio	Various Systems
		Default Management	Various Systems
		Risk Management	Various Systems
		Enterprise Dashboard	Various Systems
		Data Quality Maintenance/Management	Various Systems
		Governance	Various Systems
		System Balancing	Various Systems
		Gather data and execute triggers through analytics	Various Systems
		Integrated School View	Various Systems
		Integrated Student View	Various Systems
		Cross-System Analytics	Various Systems

Table 1 - Enterprise Analytics and Research Function Groupings

Any updates to the definition and function groupings for the Enterprise Analytics and Research Business Capability Area will be captured in this section for the 152.1.4b deliverable.

2.3 *Current Analytical and Research Capability*

In 152.1.4b, this section will illustrate FSA's need for the Enterprise Analytics Architecture Option Analysis effort by providing a high-level account of FSA's current analytical and research capabilities. The final document will review examples that make the business case for change from the current model and highlight some of the limitations identified during the working sessions. This review can help provide the baseline from which FSA can make changes to the current state and assess their impacts across the enterprise. The example provided below is a sample of the kind of business cases that could be discussed in this section for the 152.1.4b deliverable.

2.3.1 Business Example 1 – Direct Loan Gross Committed Volume

The National Student Loan Data System (NSLDS) is the official source of gross committed volume for the Federal Family Education Loan (FFEL) Program. The gross committed volume is used by several groups:

- the Department's Budget Service to prepare the President's Budget,
- the Office of Postsecondary Education (OPE) to prepare the Loan Programs Data Book and to provide loan volume updates on the Web, and
- FSA to answer internal and external data requests.

It is widely understood and agreed that FFEL gross volume is obtained by aggregating a standard set of information from NSLDS. However, the definition and source of gross volume for the Department's other primary loan program, the Direct Loan Program, is not widely understood nor agreed upon and this has resulted in inconsistent and conflicting data being produced and distributed to FSA's customers.

Direct Loan Program gross committed volume, as defined for the President's Budget, is the aggregate of all Direct Loans that have both an origination and a signed promissory note. Since NSLDS receives its Direct Loan data through a feed from the Direct Loan Servicing System (DLSS), NSLDS will be missing any Direct Loan commitments that have not disbursed. Therefore, NSLDS cannot provide a complete view of Direct Loan gross committed volume. The non-booked committed loans only reside in the Common Origination and Disbursement (COD) system and are currently accessed by the Budget Service and other parts of FSA through the official monthly extract report from COD – the Committed Loan Volume Report. Although it would be preferential to have both Direct Loan and FFEL gross volume available in one central system, that situation currently does not exist.

2.3.2 Business Example 2 (TBD)

2.4 *Common Data Architecture and Enterprise Analytics*

In 152.1.4b, this section will highlight the interrelationships between the implementation of a Common Data Architecture (CDA) and the ability for FSA to better satisfy its Enterprise Analytics and Research needs. It will setup the discussions that follow related to business and technical considerations for an Enterprise Analytics Architecture and CDA implementation.

The figure below shows the Target Conceptual Architecture developed during the Data Strategy 1.0 effort. Its purpose in this section is to highlight the specific pieces of the To-Be vision that relate to Enterprise Analytics. Also, the diagram will be used to support the discussions of the interrelationships and interdependencies associated with the target state and FSA's analytical and research needs.

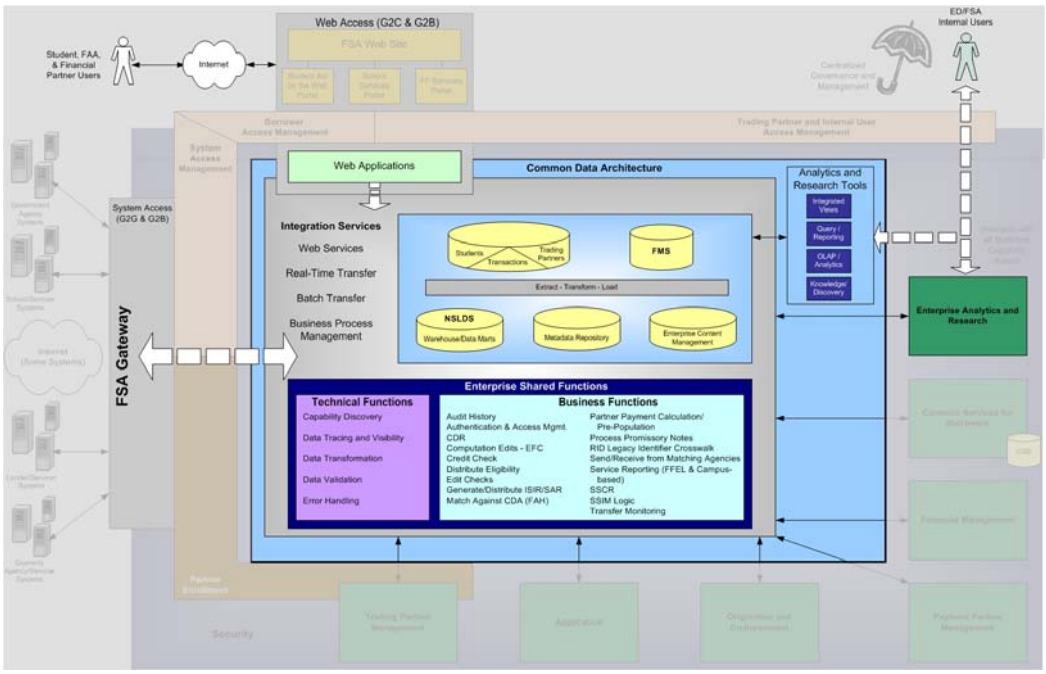

Figure 2 - Target Conceptual Architecture

3 Business Considerations

Many organizations begin with the technology and then apply it to business, often resulting in technology for technology's sake. Instead, the Enterprise Analytics Architecture Options Analysis effort will first explore what FSA wants its internal and external users to do with the technology. For the final deliverable (152.1.4b), Section 3 will address business considerations for implementing an enterprise architecture that supports FSA's analytical and research needs. This section will put the EA&R Business Capability area in the context of FSA's overall business needs.

A series of sample questions have been listed below that will be used to help drive the discussions for the working session and options analysis. Those business considerations that are captured during the working sessions and any supplemental information gathered throughout the duration of the Data Strategy 2.0 will also be highlighted here.

3.1 FSA's Analytical and Research Needs

During the 152.1.4 working sessions, key FSA business owners and program support personnel will inform the effort by relaying current analytical and research demands upon them or their business group. From this discussion will evolve a visioning effort to identify what future analytic and research capabilities would enable FSA to effectively turn data into knowledge, and knowledge into action. The focus areas of this exercise can be divided into three main topics: General Business Needs, Integrated Views, and Cross-Business Function & Cross-Enterprise Nature of Analytics.

3.1.1 General Business Needs

While Section 2.3 ("*Current Analytical and Research Capability*") gives a high-level illustration of the state of FSA's enterprise analytics and research capabilities, this section will dive deeper to identify a sample set of specific business requirements regarding analytics and research that will drive the options analysis.

Questions such as the following will drive the General Business Needs discussion:

- *What is a sample set of current and future analytical/reporting needs?*
- *What are some of the business limitations caused by the current analytical environment?*
- *How will better analytics support/improve the business processes?*
- *What are the timing considerations for FSA's analytical needs? (e.g., real time vs. right time)*
- *What are some examples of how the "As-Is" (by channel) analytical requirements can translate into effective reporting for the "To-Be" Business Capability Areas?*

3.1.2 Integrated Views

During Data Strategy 1.0, FSA identified Integrated Views as an analytical need to enable them to meet their strategic objectives. An Integrated View is simply the presentation of aggregated

enterprise-wide data about an entity (e.g., student, school, financial partner) or business function (e.g., portfolio management). For instance, an Integrated View of a Student would contain information covering all stages of the Financial Aid Lifecycle – such as from the date of the student's FAFSA submission to the date the student paid off their loan. In 152.1.4b, this section will summarize a sample set of Integrated Views identified during the working sessions.

Questions such as the following will drive the Integrated Views discussion:

- *What is an Integrated View and how can it be applied to meet FSA's business objectives?*
- *How will the CDA and enterprise analytical tools provide Integrated Views?*
- *What are the business benefits of improved customer/trading partner insight?*
- *How will EA&R enable the enterprise to utilize integrated program and portfolio views?*

3.1.3 Cross-Business Function & Cross-Enterprise Nature of Analytics

As stated in Section 2.2 (*"Definition"*), the EA&R Business Capability Area is inherently a cross-business function and cross-enterprise solution, and as such, certain integration considerations must be explored. The focus of this section in 152.1.4b will be to highlight what special business needs exist related to this integration, and how FSA can benefit from fulfilling these needs.

Questions such as the following will drive the Cross-Business Function & Cross-Enterprise Nature of Analytics discussion:

- *How can the architecture efficiently handle overlapping data needs and reporting requirements for multiple channels?*
- *How will the CDA enable the sharing of student and trading partner data throughout the lifecycle?*
- *How will the CDA enable the sharing of data between the front-end and back-end processes?*
- *What kind of visibility does FSA have into customer data and process bottlenecks across the lifecycle?*
- *How will the CDA and EA&R reduce redundant data storage and feeds but still fulfill analytical and research needs?*

3.2 Stewardship and Governance of Data

As with any cross-business function and cross-enterprise solution, the stewardship and governance of the solution must be addressed. Enterprise data is the root of the EA&R Business Capability Area, and so the standards and processes that define how that data is manipulated have a direct impact on the architecture options identified to support FSA's analytics and research capabilities. In 152.1.4b, this section will not provide a full analysis of the stewardship and governance of data, but will instead reference the analysis documented in the *Data Strategy Target Vision Common Data Architecture Operating Guidelines Options* (152.1.5) deliverable (due 6/30/2004), and illustrate how the findings of that effort relate to Enterprise Analytics Architecture Options.

Questions such as the following will drive the Stewardship and Governance of Data discussion:

- *How can FSA manage the integration considerations from multiple business capability areas for access to shared data?*
- *What key findings identified in the CDA Operating Guidelines (152.1.5) need to be factored into the Enterprise Analytics Architecture options analysis?*

3.3 Risk/Rule Model – Case/Policy Management

The Risk/Rule Model is a centralized set of business rules and logic, utilized primarily by FSA's Case/Policy Management business group(s), used to receive timely updates on varying types of school compliance issues, and more rigorously monitors school risk indicators across all school-related databases. These indicators would enable CMO to identify at-risk behaviors not otherwise known through recertifications, financial statements, or audits of schools.

The architecture options identified to support analytics and research in 152.1.4b will also need to support the Risk/Rule Model. Therefore, this section of 152.1.4b will analyze business considerations pertaining to the implementation of a Risk/Rule Model.

Questions such as the following will drive the Risk/Rule Model – Case/Policy Management discussion:

- *What is a risk/rule model and why is it important to FSA?*
- *Where in the business process(es) should a risk/rule model application be applied?*
- *How will the CDA and EA&R effectively manage business requirements and monitor processes (e.g., Schools – Eligibility and Title IV compliance; Borrowers – Ombudsman Case Management Process; and, Trading Partners – Financial Audit Reviews)?*

3.4 Industry Examples of Enterprise Business Intelligence Implementations

This section will provide some industry examples that support FSA's target vision.

4 Technical Considerations

For the 152.1.4b deliverable, this section will outline some technical considerations derived from the discussion of the business needs from the preceding section. By first completing a review of FSA's business objectives, FSA will ensure that technology concepts are grounded by specific business applicability. This section will also define the impact the technical considerations could have on the options analysis. As 152.1.4b presents the options analysis, some possible areas of discussion might include the following technical considerations (though this breakdown will be further refined based on input from FSA working sessions):

4.1 Performance

- The ability for the architecture options to handle the volumes of data that support FSA's processing needs.
- The ability for the architecture options to deliver reports in a timely manner.

4.2 Scalability

- The ability for the architecture options to handle growth in the amount of business supported by the applications. (e.g., increase in the number of online FAFSA submissions)

4.3 Flexibility

- The ability for architecture options to adapt to changes in business requirements.

4.4 Interoperability

- The ability for individual systems or products within the architecture to integrate with other systems or products within the architecture.
- The ability for the architecture options to support the various devices, services, platforms, and applications that may make up the FSA environment.

4.5 Portability

- The ability for pieces of the architecture options to be used in an operating system other than the one in which it was created without requiring major rework.
- The architecture's ability to adhere to the mantra "write once, run anywhere."

4.6 Reusability

- The ability for multiple business areas to leverage centralized, common logic and shared functions.

4.7 Security

- The ability for the architecture options to support and comply with FSA IT security policy and standards.
- The ability for the architecture options to protect privacy data.

5 Options Analysis

The goal of the options analysis section will be to review possible architectural scenarios that can enable FSA's target state for enterprise-wide analytics, research and reporting needs. This section will be further defined after the business and technical considerations have been collected. Architecture options may be deployed for each of the three architecture layers:

- Storage and Business Intelligence Layer — *Tools used to store and analyze data that support the analytical and processing needs of FSA's business.*
- Access and Presentation Layer — *End –user access and system interfaces to the Storage and Business Intelligence Layer.*
- Integration Services Layer—*Tools and practices that support the Storage and Business Intelligence Layer and provide better visibility into enterprise data and business processes.*

In the 152.1.4b deliverable, further definitions and more detailed visual representation of this layered approach will be provided to more effectively illustrate the options analysis breakdown. Figure 3 provides an initial visual representation of these layers:

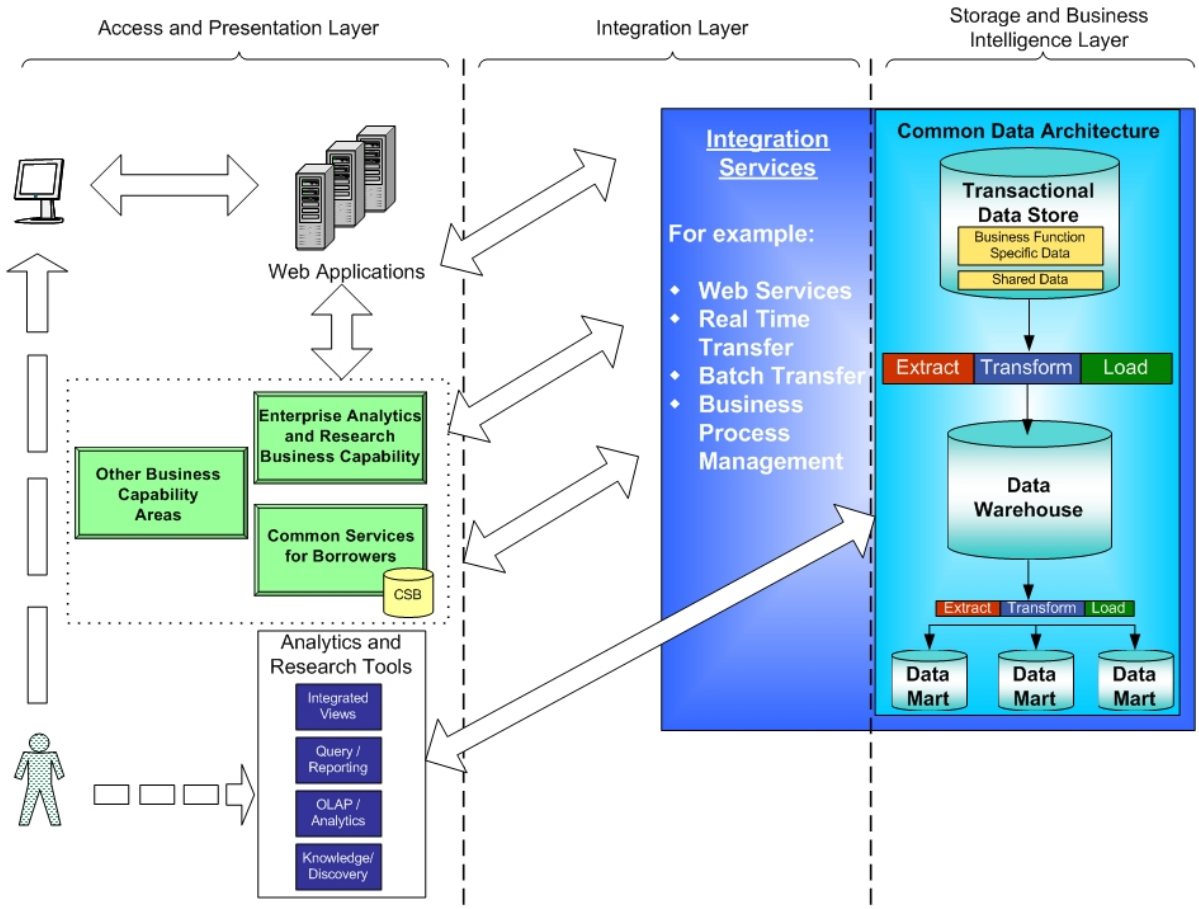

Figure 3 – Architecture Layers Example

Below are a sample set of questions to review for each architecture layer that could provide input during the options analyses discussions. The final deliverable (152.1.4b) will review the architecture options that can satisfy FSA's business needs for enterprise analytics.

5.1 Storage and Business Intelligence Layer

5.1.1 Options Description

- What kind of Operational Data Store (ODS), Data Warehouse (DW) and Data Mart configuration(s) could FSA utilize?
- How do Metadata management and Enterprise Content Management (ECM) contribute to FSA's objectives and the establishment of a CDA?
- How could the To-Be architecture effectively store 1) Shared Data (e.g., student demographics), 2) Transaction Result Data (e.g., EFC), and 3) Business Function Specific Data (e.g., loan consolidation criteria)?
- How could the architecture utilize Extract Transform and Load (ETL) tools, Web services, replication and synchronization processes to move and manage FSA's data?
- How will the CDA meet FSA's archiving, data restoration and historical correction needs?
- What tools and enterprise functions can the architecture employ to enable data analysis that best aligns with FSA's business needs?
- How much data transformation/aggregation/summation is needed to support desired business needs?

5.1.2 Options Analysis

- How well do the options enable the business and FSA's To-Be Vision?
- How well do the options comply with the technical considerations?
- What are the advantages and disadvantages of utilizing the options?
- How well do the options align with current trends in the marketplace?

5.2 Access and Presentation Layer

5.2.1 Options Description

- How does the Access and Presentation layer interact with the ODS, DW and Data Marts?
- What kind of options could be available for end-users (internal and external) and all business capability areas to gain access to enterprise data (e.g., portal, direct query, etc)?
- How do these options accommodate operational functions (e.g., customer-facing web applications) in addition to EA&R – related access and presentation?

5.2.2 Options Analysis

- How well do the options enable the business and FSA's To-Be Vision?
- How well do the options comply with the technical considerations?
- What are the advantages and disadvantages of utilizing the options?
- How well do the options align with current trends in the marketplace?

5.3 Integration Services Layer

5.3.1 Options Description

- What functions will be supported by the integration services layer? (e.g., Business Process Management, Workflow, Shared Services, Real-time and Batch Transfers)
- How will the CDA enable the deployment of Enterprise Shared Functions?
- What tools can be employed to enable those functions? (e.g., XML Framework, Web services, Rules Engine, Business Activity Monitoring)
- What role do integration services play between the Access and Presentation Layer and the Storage and Business Intelligence Layer?
- How will the integration services provide better visibility into and management of enterprise data?

5.3.2 Options Analysis

- How well do the options enable the business and FSA's To-Be Vision?
- How well do the options comply with the technical considerations?
- What are the advantages and disadvantages of utilizing the options?
- How well do the options align with current trends in the marketplace?

5.4 Industry Examples of Enterprise Analytics Architectures

- What are some industry examples that support FSA's target vision?

6 Summary

The final section of deliverable 152.1.4b will provide a summary assessment of the options presented in Section 5 and compile a sample comprehensive solution that provides a viable architecture option for meeting FSA's business needs and enabling the target state. The final analysis will factor in the business and technical considerations, industry trends, and potential return on investment. It will also discuss the overall benefits that can be achieved by implementing the proposed option.