

APPENDIX C
METHODOLOGY

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1. METHODOLOGY

The development of the *Project EASI/ED Transition Strategy* involved the analysis of the current Title IV systems and Project EASI/ED subsystems at various levels of detail and from both a functional and physical perspective. Recognizing the complexity that is inherent in a multi-dimensional analysis, a methodology was used that layered the analysis in such a way that each layer could be analyzed and evaluated to produce a result for that layer. Each layer of the methodology builds off the results of the previous layers, combining to provide the key components of the Project EASI/ED transition strategy schedule.

This section describes the main analysis layers and the steps taken within each layer. The following subsections present the main analysis layers:

- **1.2.1 - Structure and Scope of Deliverable** describes the development of the work plan, annotated outline of the deliverable, assumption list, and issues, risks, and mitigating strategies.
- **1.2.2 - Feasibility of Partial Shutdown of the Title IV Systems** describes the functional and physical analysis of the Title IV systems, the development of evaluation criteria for assessing feasibility of partial shutdown, and the evaluation of the Title IV systems.
- **1.2.3 - Implementation Sequence of Project EASI/ED Subsystems** describes the analysis of the potential drivers of the Project EASI/ED subsystem implementation order; the development of evaluation criteria for assessing the overall impact to the current Title IV systems; and the degree of technical complexity associated with the Project EASI/ED subsystem implementation sequence.
- **1.2.4 - Estimation Technique** describes the analysis of various software development estimation techniques, review of available Project EASI/ED information, the selection of a requirements-based estimation technique, and the application of the requirements-based estimation technique to Project EASI/ED.
- **1.2.5 - Early Conversion to the Project EASI/ED COE** describes the analysis of the Project EASI/ED transition schedule to identify candidates for early conversion of current Title IV systems to the EASI/ED COE and the evaluation criteria used to assess feasibility and value of early conversion.
- **1.2.6 - Project EASI/ED Transition Organization** describes the analysis and selection of an organizational structure and the definition of the roles and responsibilities for the transition organization.

Each subsection presents the steps taken to perform the analysis required at each layer. Secondary results are presented, within each subsection, to provide additional insight and clarity to the overall analysis process. Primary results for each layer of analysis are presented in Section 3 of the main document, except for subsections 1.2.4 and 1.2.6, which have Sections 4 and 5, respectively, dedicated to their primary results. Detailed analysis supporting both primary and secondary results can be found in the appendices. Exact locations for primary results and detailed analysis are sited within each of the Appendix C subsections.

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Note that some steps in the methodology may occur concurrently and/or continuously throughout the development lifecycle of the Project EASI/ED transition strategy.

1.1.1 Structure and Scope of Deliverable

This subsection details the general steps followed to structure and scope the Project EASI/ED transition strategy deliverable.

Step 1 - Developed a work plan for the *Project EASI/ED Transition Strategy* task. A high level work plan identifying key analysis completion points, internal and external meetings, cross team task dependencies, work product reviews, and delivery milestones was developed.

Step 2 - Developed an outline for the *Project EASI/ED Transition Strategy* deliverable. An annotated outline was developed for this deliverable to frame the work required for completing the document. The annotated outline was given to ED for review, comment and final approval.

Step 3 - Developed assumptions for the *Project EASI/ED Transition Strategy*. An initial list of assumptions was developed to provide a framework for developing the transition strategy and schedule and for scoping what would be included and not included in the deliverable. This list of assumptions was continually modified and expanded during the development of this transition strategy.

Step 4 - Detailed issues, risks and mitigating strategies. Issues and risks were tracked in the Project EASI/ED issues and risks databases. Action items were identified for each issue and mitigation strategies were identified for each risk. Issues and risks that are open as of the draft due date are included in the draft deliverable.

1.1.2 Feasibility of Partial Shutdown of the Title IV Systems

This subsection details the steps taken to analyze the feasibility of partial shutdown of the Title IV systems. Understanding the feasibility for partial shutdown for each of the Title IV systems is a key component in supporting the Project EASI/ED transition strategy and in developing the Project EASI/ED transition strategy schedule.

The Project EASI/ED transition strategy is based on transitioning in multiple phases, each phase resulting in an operational environment composed of progressively more Project EASI/ED subsystems and progressively less current Title IV systems. Functionality that has been assumed by Project EASI/ED will have to be shut down within the Title IV systems that previously provided the same functionality. However, these Title IV systems will have to continue to provide functionality that has not yet been assumed by Project EASI/ED, hence the need to partially shut down the Title IV systems over time.

The Project EASI/ED schedule was determined based on a combination of several factors, with the primary goal being to minimize the technical risk of both the development of Project EASI/ED and of the impacts of the transition to the day to day operations of SFAP. One of the many factors effecting technical risk is the feasibility of partial shutdown of the Title IV systems. For example, a schedule with a grouping of Title IV systems requiring partial shutdown that have a low

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feasibility for partial shutdown will increase technical risk. The Project EASI/ED transition strategy schedule reflects a balance between shutting down the Title IV systems in as an efficient a manner as possible and controlling the level of technical risk associated with such an approach.

Based on the review of existing information and information collected in interviews with current Title IV systems representatives, the physical application structure for each of the current Title IV systems was determined. Based on the number and complexity of the dependencies among physical application components and between physical application components and the data structures, the relative feasibility and ease of partial shutdown were determined.

The following steps detail the analysis of the feasibility of partial shutdown for the Title IV systems.

Step 1 - Gathered and reviewed available documentation. General background information, available Title IV system Government Furnished Information (GFI), and Project EASI/ED documentation from the project library was gathered and reviewed. The GFI documentation, related to the Title IV systems, helped provide a high level understanding of the functionality, physical application structure, and relationship between functionality and physical application structure of the current Title IV systems.

Step 2 - Conducted interviews on current Title IV systems. For each of the current Title IV systems, interviews were conducted with ED and/or contractor staff who were familiar with the Title IV system functionality, physical application structure, and the relationship between the two. The purpose of the interviews was to gather information on current systems' functionality and the physical structure of the application software in order to assess the ease of partial shutdown. Discussion packets were prepared for each interview describing the logical and physical structure of the applications. Data Flow Diagrams (DFD) from the *Project EASI/ED Current Systems Model, April 16, 1997* were used to define the logical processes of the current Title IV systems and used Title IV system GFI documentation to identify the application physical structure. Based on this information, a matrix for each Title IV system identifying the mappings between the logical processes and the physical application structures supporting those logical processes was developed. During the interview, the mappings between the logical and physical structures were reviewed and refined.

Step 3 - Developed Title IV system profiles. Profiles for each Title IV system were developed based on the information gathered and confirmed at the interviews. These profiles describe the operational environment, development platform, data management software, physical application structure, relationships between the physical application structure, logical functionality, and data structures, and current and future enhancements to both the functionality and physical design of the Title IV systems. The profiles were submitted to the attendees of the interviews for review and correction and are located in Appendix D of this document.

Step 4 - Developed and assessed functional/physical mappings between the current Title IV systems and Project EASI/ED subsystems. Using current Project EASI/ED documentation and the information gathered in the interviews, physical application structure information was added to the functional mappings between Project EASI/ED requirements and processes, and current Title IV systems and processes. These functional mappings had been developed during the current systems analysis phase of Project EASI/ED. Documentation reviewed included Data Flow Diagrams (DFD), Activity Hierarchy Diagrams and Requirement Traceability Matrix (RTM)

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reports. Analysis of these mappings provided an understanding of the impacts, both functional and physical, on the Title IV systems as they relate to the implementation of each of the Project EASI/ED subsystems. Appendix C contains the results of this mapping effort.

Step 5 - Developed criteria for evaluating relative ease of partial shutdown. 13 criteria were developed to evaluate the relative ease of partial shutdown of the Title IV systems. The criteria focused on addressing the technical complexity associated with the partial shutdown of each Title IV system. The criteria were developed based on industry best practices criteria modified to reflect the information available about the Title IV systems.

Step 6 - Ranked the current Title IV systems on the ease of partial shutdown. Each of the current Title IV systems was evaluated against the 13 criteria for determining ease of partial shutdown. Total scores for each system were calculated. Title IV systems scoring high reflect a relatively lower technical complexity associated with partial shutdown compared to those Title IV systems scoring low. Subsection 3.2, in the main document, presents the results of the evaluation of ease of partial shutdown and Appendix C contains the actual evaluation of the ease of partial shutdown of the Title IV systems.

1.1.3 Implementation Sequence of Project EASI/ED Subsystems

In order to develop the Project EASI/ED transition strategy schedule it was necessary to decide how the development of the schedule would be driven. Two choices were available, a Project EASI/ED subsystem driven schedule or a current Title IV systems driven schedule. The Project EASI/ED subsystem driven schedule was chosen because it provides more of a functionality based implementation approach. The next decision was to determine the implementation sequence of the Project EASI/ED subsystems. Several implementation sequence drivers were identified, analyzed, and evaluated. The following is an example list of the implementation drivers considered:

- **Process** - Selecting systems for implementation in order of the steps in the student financial aid lifecycle (i.e., Application, Origination and Disbursement, Accounting, Repayment).
- **Reverse Process** - Selecting systems for implementation in reverse order of the steps in the student financial aid lifecycle (i.e., Repayment, Accounting, Origination and Disbursement, Application).
- **Difficulty** - Systems that are easy to transition or develop would be implemented before those of increased technical complexity.
- **Business Impact** - Selecting systems for implementation in order of impact to business operations and impact on the post-secondary education community (e.g., lenders, institutions, students, etc.).
- **Internal Need** - Implementing systems first where ED places the greatest need. For example, a technically obsolete system might be replaced before more modern systems.
- **External Need** - Selecting systems for implementation in order of need as identified by the post-secondary education community (e.g., lenders, institutions, students, etc.).

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- **Development Schedules** - Select systems for implementation in an order that least impacts current Title IV systems development effort underway.

The final decision was to select a single driver and its associated Project EASI/ED subsystem sequence as an initial base-line for developing the Project EASI/ED transition schedule.

This subsection details the steps taken to determine the implementation driver and associated sequence of the Project EASI/ED subsystems.

Step 1 - Selected three potential Project EASI/ED implementation drivers and developed associated sequences. Three potential implementation drivers were selected for Project EASI/ED: external need, development schedule, and internal need. These three were selected because they cover a broad spectrum of interests; considering the primary stakeholders in the implementation of Project EASI/ED as well as considering the impact to the current Title IV systems operation. The initial sequences for the external and internal need drivers were developed based on information contained in Section 4, Justification for Change, in the *Project EASI/ED Concept Document, Revised Final, June 1997* as well as other information obtained during the concept and definition phases of Project EASI/ED. The resulting initial sequence for external need was reviewed with several representatives of the post-secondary education community while the resulting initial sequence for internal need was reviewed with several representatives of ED including the Deputy Assistant Secretary for Student Financial Assistance. As a result of each review session, the corresponding sequence was modified. The sequence for the development schedule driver was developed based on information gathered during the meetings held with the current Title IV system representatives, described in subsection 1.2.2 step 2 and documented in the Title IV system profiles, described in subsection 1.2.2 step 3. Table C 1-1 provides a definition for each implementation driver and presents the resulting Project EASI/ED subsystem sequence.

External Need	Development Schedule	Internal Need
Implementing Project EASI/ED subsystems in order of need perceived by the post-secondary education community	Implementing Project EASI/ED subsystems in an order that least impacts current systems development efforts underway	Implementing the Project EASI/ED subsystems in order of need as perceived by ED
Origination & Disbursement Application Repayment DSS PMOS Financial Services	Repayment Application Origination & Disbursement PMOS Financial Services DSS	Origination & Disbursement Financial Services DSS Application PMOS Repayment

Table C 1-1 Project EASI/ED Subsystems Sequence Drivers and Sequences

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Step 2 - Assessed impact to the current Title IV systems and technical risk associated with the three implementation sequences. The bridges projects are considered to be the most technically complex of all Project EASI/ED projects. Bridges are required as part of the Project EASI/ED transition because of the phased approach and partial shutdown strategy discussed in subsection 1.2.2. of this appendix. A bridge will function as the link by which data can be shared between the operational portions of Project EASI/ED and the partially shutdown Title IV systems requiring data in order to continue to provide their remaining functionality. Varying the implementation sequence of the Project EASI/ED subsystems changes the number of bridges that need to be built and the number of operational bridges over the SDLC of Project EASI/ED.

To assess impact to the current Title IV systems, each sequence was evaluated based on:

- The total number of bridges that would have to be built and the total number of bridges required to be operational between the Title IV subsystems which are left operational and Project EASI/ED subsystem planned for implementation.
- The relative ease and timing of partial and full shut down of impacted Title IV systems.

The bridges' analysis involved a review of how each Title IV subsystem interacts with that system's database(s) and other subsystems. The full shutdown analysis entailed a review of the mappings from the current Title IV systems to the Project EASI/ED subsystems by sequence to determine when systems fully shut down.

- To assess the technical risk associated with each sequence, risk evaluation criteria were developed and assessed for each sequence. The level of risk over the implementation life cycle of each of the Project EASI/ED subsystems within the sequence was evaluated. The level of risk was evaluated in terms of the shape of a curve that would be created if the level of risk was plotted over the life cycle of the sequence implementation.

In addition to the three candidate sequences, three other sequences were assessed. The sequences that would result in building the most and fewest bridges (Maximum and Minimum Bridge Sequences) and the sequence that would shut down the current Title IV systems as early as possible. It turned out that the sequence that required building the fewest bridges also shut down the Title IV systems as early as possible.

Step 3 - Selected an initial sequence for the Project EASI/ED subsystems. After discussions with ED, the minimum bridge sequence was selected as the implementation sequence for the Project EASI/ED subsystems. This sequence was reviewed with the external ED community and internal ED representatives for comments. As a result of feedback, the sequence was modified to bring the Financial Services subsystem to the beginning of the sequence. This modified minimum bridges sequence was used as a starting point for the transition strategy. Subsection 3.3 in the main document presents the results of this analysis and this appendix presents the detail supporting the analysis.

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1.1.4 Estimation Technique

An estimation technique was selected that provided for the development of the most accurate timeframes possible for the infrastructure projects and Project EASI/ED subsystem projects based on the existing information available related to Project EASI/ED.

This subsection describes the process of selecting a time based estimation technique for Project EASI/ED and the application of the estimation technique to Project EASI/ED.

Step 1 - Researched industry best practices estimating techniques. In order to develop subsystem implementation timeframe estimates, an investigation of estimating techniques and estimating best practices was initiated via internal PricewaterhouseCoopers (PwC) sources and through the Internet.

Internet searches resulted in the identification of several estimating methodologies and program management techniques such as the COCOMO (Constructive Cost Model) and Monte Carlo models and the use of the Work Breakdown Structure (WBS) and Function Point (FP) Analysis. All of these approaches proved to be unusable, at this time, for the Project EASI/ED timeframe estimation effort because they required a level of technical physical information (data and application related) about Project EASI/ED that is not currently available. These estimation techniques require inputs such as the number of screens, number of reports, physical database size (entities and attributes), the development language, and/or the estimated number of lines of code.

PwC sources investigated include:

1. Proprietary Databases:
 - Knowledge View, PwC's proprietary research service
 - Gartner Group Research Database
 - Forrester Research Database
 - Faulkner's Advisory on Computer and Communications Technologies (FACCTS) Database
 - Tower Group Research Database
 - PwC's Data Warehousing Center of Excellence
2. Identification and interviews with Subject Matter Experts (SMEs) within PwC. SMEs were identified based on their level of knowledge relative to the following characteristics:
 - Depth of experience related to the successful application of various estimating methodologies in a variety of business and technical environments.

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- Successful application of various estimating methodologies in business areas and technical environments similar to those of ED, such as projects dealing with the migration of business processes related to the origination and maintenance of loans, or projects dealing with the migration of multiple legacy systems into a common operating environment using multiple implementation options (e.g., Reuse, COTS application, Outsourcing, and/or Custom Development).
 - Experience with Data Warehousing (DW) and Decision Support System (DSS) analysis, design, development and implementation.
3. Current projects within PwC that are of similar:
- Size - related to both the current legacy environments and the proposed technical environment (e.g., data and applications, logical and physical perspectives)
 - Technical complexity
 - Business functionality
 - Client needs, organizational structure and political challenges

As a result of the research on the Internet and within PwC, the following approach was developed for determining the relative timeframes for Project EASI/ED. The approach is a layered approach involving several steps, each building on the results of the previous, to achieve the base timeframes for the subsystems and provide factors that can be applied to adjust the base timeframes relative to the possible implementation options (e.g., reengineering, reuse, COTS application, and outsourcing).

Project EASI/ED consists of six subsystems that provide the envisioned functionality. The time required for the development and implementation of each subsystem is included in the transition schedule. For the purposes of timeframe estimation only, a Project EASI/ED subsystem System Development Life Cycle (SDLC) is comprised of four phases:

- **Analysis** includes activities such as feasibility study, system abstract, process definition, prototyping, data definition, and technology definition. Maps to the Concept and Definition Phases of the Project EASI/ED methodology.
- **Design** includes activities such as process design, data design, and technology design. Maps to the Design Phase of the Project EASI/ED methodology.
- **Construction** includes activities such as user procedures, program generation, program design, program coding, unit testing and system testing. Maps to the Construction and Testing Phases of the Project EASI/ED methodology.

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- **Implementation** includes activities such as training, data conversion, implementation and system acceptance. Maps to the Implementation Phase of the Project EASI/ED methodology.

Step 2 - Assessed Project EASI/ED available inputs and selected a requirements-based estimation approach. Based on the SDLC phases, described above, and the available information related to Project EASI/ED, a system requirements-based approach for developing time estimates for the development of Project EASI/ED was selected. This approach requires:

- A set of Project EASI/ED functional system requirements.
- Mappings between functional requirements, processes and Project EASI/ED subsystems.
- Assignment of a technical development complexity rating of High, Medium, or Low to each functional requirement.
- Assignment of a development time for each complexity rating.

The *Project EASI/ED BARD* documents the envisioned functionality of the Project EASI/ED system and defines the requirements necessary to implement that functionality. The RTM was developed to support the creation of the *BARD*. The RTM documents the mappings between existing Title IV system processes, requirements, and Project EASI/ED processes. The *Project EASI/ED ASDD: SID* defines the six Project EASI/ED subsystems, subsystem processes, and their associated requirements. Based on these sources of information it was possible to determine the requirements that are mapped to Project EASI/ED processes and the processes mapped to Project EASI/ED subsystems. This chain of mapping allows for the identification of the requirements associated with a subsystem. The following activities were then completed:

- Assigned complexity ratings to each of the functional requirements.
- Determined the timeframe (hours) associated with each complexity rating.
- Calculated the relative timeframe for Project EASI/ED and timeframes for each subsystem based on this approach.

The remaining steps in this subsection detail the development and use of information supporting this approach.

Step 3 - Analyzed Project EASI/ED requirements and assigned relative technical development complexity factor. The analysis of the requirements considered all phases of the SDLC and for the initial analysis assumed the implementation option for all subsystems to be custom development. Each of the Project EASI/ED process requirements were analyzed in order to determine the relative technical complexity associated with the actual development of the requirement. Technical complexity was evaluated on a three-tier scale: high, medium, and low. Definitions for each rating can be found in Table C1-2 on page 1-11. Based on the definitions, the appropriate complexity rating was assigned to each of Project EASI/ED's functional requirements.

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Step 4 - Analyzed the Department of Education Central Automated Processing System (EDCAPS)/Grants Administration and Payment System (EDGAPS) (EDCAPS/GAPS) requirements and determined relative equivalent requirements. With assistance from EDCAPS/GAPS management, the requirements associated with the development of the Phase I release of EDCAPS/GAPS were analyzed. EDCAPS/GAPS requirements were analyzed using the same technical complexity ratings as used in the analysis of Project EASI/ED requirements until three or four EDCAPS/GAPS requirements for each of the complexity ratings, were identified.

Step 5 - Researched required hours to develop EDCAPS/GAPS requirements for each complexity factor and determined hours estimation for each complexity factor. Each requirement, within each grouping by complexity rating, was then investigated to determine the actual hours required for developing the functionality of the requirement. Based on the individual requirements within each grouping, the average development hours for the construction phase of SDLC were calculated for each of the complexity ratings and are presented in Table C1-2 on the next page.

Step 6 - Assigned technical complexity ratings to interfaces, bridges, and reports. Construction hours were assigned to interfaces, bridges, and reports based on the high, medium, and low scale developed for requirements. The assignments were:

- Interfaces were assigned as a medium technical complexity.
- Reports were assigned as low technical complexity.
- Bridges were assigned as twice the medium technical complexity. (A bridge was assumed to be twice as complex as an interface).

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Table C1-2 provides the levels of complexity, complexity definitions, and associated hours discussed in steps 4 and 6 above.

Level of Complexity	Definition	Hours
Bridges	All of the following: Complex intelligence Data conversion Data cleansing Simultaneous support of current TIV systems and Project EASI/ED subsystems	634
High	One of the following: Complex calculations Simulations Integration of processes or programs Reconciliations Involves more than 3 subject areas	423
Medium	One of the following: Writing to the database Imaging Interfaces Maintenance Simple calculations Involves 3 or less subject areas	317
Low	One of the following: Standard reports Reading from the database Information dissemination Involves less than 3 subject areas	141

Table C 1-1 Technical Complexity Levels, Definitions, and Hours

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Step 7 - Assigned manpower resources to each Project EASI/ED subsystem project. Each project within a Project EASI/ED subsystem that was based on EASI/ED requirements, was assigned the following initial staffing level in order to determine the SDLC timeframe for the project. Table C1-3 presents the initial staffing levels.

Scenario1 - REUSE Implementation Options	Staffing Levels for SDLC Timeframes based on EASI/ED Requirements by Project and Subsystem
Financial Services	80
Project - COTS	50
Project - Bridges	30
Aid Application	70
Project - Reuse	20
Project - Custom	30
Project - Bridges	20
PMOS	90
Project - Reuse	10
Project - ReEngineering	20
Project - COTS	20
Project - Custom	20
Project - Bridges	20
Origination and Disbursement	80
Project - Reuse	20
Project - Custom	40
Project - Bridges	20
Aid Repayment	80
Project - Reuse	20
Project - COTS	40
Project - Custom	20
DSS	10
Project - COTS	10

Table C 1-2 Project EASI/ED Subsystem Project Initial Staffing Levels

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Step 8 - Assigned appropriate hours estimation to Project EASI/ED requirements, interfaces, bridges, and reports for each Project EASI/ED subsystem and calculated timeframes. The hour estimates were then applied to the Project EASI/ED requirements, interfaces, bridges, and reports. Timeframes related to the construction phase of the SDLC for the Project EASI/ED subsystems (except the DSS subsystem) were calculated.

Step 9 - Determined DSS subsystem timeframe. The DSS subsystem is the only EASI/ED subsystem that does not have a complete set of requirements currently defined in the *BARD*. A comprehensive set of requirements was not developed for the DSS because during requirement definition only requirements supporting logical functionality were identified. The DSS's functionality is considered physical functionality. In order to determine the timeframe for the construction phase of the DSS subsystem, DSS development projects were researched and interviews with several DSS and DW SMEs were conducted. Based on the general categories of functionality, the number of Title IV systems and their relative sizes, the estimated volume of data, and the transition strategy, the full life cycle of the DSS development was estimated at 1.5 years.

Step 10 - Determined relative times for other phases of the SDLC. Relative times for each phase of the SDLC (analysis, design, construction, and implementation) were researched using proprietary databases and methodologies. The results of the secondary research were discussed with senior PwC experts for confirmation. Experts recommended that the following percentages for each phase of the lifecycle be used:

- Analysis 20%
- Design 20%
- Construction 50%
- Implementation 10%

The construction phase above includes program coding, unit testing, and system testing. The times for the construction phase were used to derive times for the analysis, design and implementation phases for each subsystem. These times were aggregated to form the custom development baseline.

Step 11 - Sequential custom development baseline established. At this point, the Project EASI/ED transition schedule showing the sequential development of the Project EASI/ED subsystems assuming an all-custom software development effort existed.

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Step 12 - Reviewed recommended implementation options. The output provided by the *Project EASI/ED ASDD: IOA* deliverable was reviewed. Implementation options for each process were selected and then the processes within each subsystem were sorted and grouped into logical project groups (e.g., COTS application, Outsource, Reuse, Custom) based on the implementation priority order provided by ED:

- Outsourcing
- COTS application
- Reuse
- Custom

Step 13 - Applied ED preferences to implementation options. Based on discussions with ED, the following implementation preference scenarios were used to develop sets of potential implementation projects:

1. Maximize the reuse of current Title IV systems, with COTS implementation as a secondary preference.
2. Outsource functionality if possible, with COTS implementation as a secondary preference.
3. Implement COTS functionality where possible, with outsourcing as a secondary preference.

To define the implementation projects for scenario 1, the extent to which each Project EASI/ED process could be implemented through reuse of current systems was determined. Where a process was not a candidate for implementation through reuse, it was determined whether or not the process could be implemented using COTS. Only in cases where the process could not be implemented through reuse or COTS was the entire process selected for custom development. In many cases only a portion of a Project EASI/ED process could be implemented through reuse – the remaining percentage of the process was selected for custom development. The results of this analysis can be seen in Appendix E, Section 3, subsection 3.1.

To define the implementation projects for scenarios 2 and 3, the implementation options identified in the *Project EASI/ED ASDD: IOA* were used as a basis. Wherever outsourcing or COTS implementation was a candidate, the appropriate selection was made based on the scenario. If neither outsourcing nor COTS was a candidate, then custom development was selected. The results of this analysis can be seen in Appendix E, Section 3, subsection 3.2.

For the purposes of developing implementation projects and timeframes for inclusion in the transition schedule, scenario 1 was preferred by ED.

Step 14 - Determined timeframes for implementation options. In order to determine timeframes for each of the implementation options it was necessary to develop conversion factors for each implementation option. The conversion factors are applied against the custom base line

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hours to achieve the new implementation option hours. Table C1-4, below, presents the conversion factors to convert from custom development to each implementation option type and back to custom. The actual conversion factors were estimated based on information resulting from research of proprietary databases and experiences of senior PwC project managers and partners.

Implementation Options	CUSTOM	ReEngineering	COTS (Supplemented)	COTS (Customized)	COTS (Standard)	OUTSOURCING	Reuse
CUSTOM	1.000	0.700	0.850	0.800	0.750	0.700	0.500
ReEngineering	1.429						
COTS (Supplemented)	1.177						
COTS (Customized)	1.250						
COTS (Standard)	1.333						
OUTSOURCING	1.429						
Reuse	2.000						

Table C 1-3 Implementation Option Conversion Factors

In the above table, reengineering refers specifically to the reverse and forward engineering of the PEPS on-line screens to form part of the Program Management and Oversight subsystem user interface. Also, reuse refers to the modification of a current Title IV system so that its data element definitions match those of the EASI/ED enterprise database.

The shaded numbers running horizontally across the table are the factors that would be applied to the custom baseline hours to convert them to the associated implementation option hours. If a decision is made to change the implementation option, the associated hours must first be converted back to custom and then to the new implementation option. The shaded numbers running vertically are used to accomplish the conversions back to custom. For example, if a project exists with a baseline of 100 hours of custom development work and it is decided that the project shall actually be implemented as COTS application (standard), the 100 hours would be multiplied by .75 resulting in 75 hours. If it were then decided that it would be better to outsource, the 75 hours would first have to be multiplied by 1.333 to convert them back to 100 custom hours. The 100 hours of custom development could then be multiplied by the outsourcing factor of .70 resulting in 70 hours for outsourcing.

Step 15 - Incorporated timing of implementation options into schedule. For each implementation option, a project was created in the transition schedule. The conversion factor for that project type and the related percentages at the process level were applied to the custom development baseline. At this point, the transition strategy reflected, for each Project EASI/ED subsystem, a set of implementation projects (i.e., COTS application, reuse, outsourcing, etc.).

Step 16 - Developed and/or added other timeframes into the transition strategy. Using both primary and secondary research, timeframes were developed for the following inputs to the transition strategy:

- **Acquisition Planning** – A planning period to prepare the acquisition requirements and strategy.

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- **COTS Selection** – A period of time for the evaluation and selection of a COTS package.
- **Acquisitions** – The cycle covering the creation of a Request for Proposal (RFP), Task Order, or similar contractual vehicle through contract award.
- **System-Wide Implementations** - System-wide activities that establish the foundation for the Project EASI/ED subsystems (i.e., data conversion strategy, performance planning, security strategy, and technical environment design).
- **SFAP Organizational Change** - Tasking necessary for SFAP to prepare for and implement organizational change.
- **Infrastructure** – The hardware, system software, data conversion, and enterprise database in support of the development, test, training, and production environments.
- **Integration Testing** - The functional and/or business rules testing of the interfaces between new components and existing components as well as conducting stress tests on the applications and hardware.
- **Program Management** – The control, management and oversight of multiple projects.

In addition, timeframes were added for:

- **Project EASI/ED impacts to Title IV Systems** – Time for modifications to be made to impacted Title IV systems related to partial and full shutdown, bridges, reuse, and reengineering.
- **Current Title IV System Contracts** – Timeframes based on existing contract and option year dates as provided by ED.
- **Title IV Systems Migration to Band 1** – Migration to Band 1 timeframes for each Title IV system as provided by ED.

Step 17 - Compressed implementation sequence to reflect parallel development activities. At this point, the Project EASI/ED transition strategy schedule reflected a completely sequential implementation at all levels of implementation (subsystem and project). The Project EASI/ED transition strategy schedule was reviewed to identify opportunities for parallel development and was compressed to take advantage of identified opportunities while maintaining sight of the objectives of controlling technical complexity and managing resource requirements.

1.1.5 Early Conversion to the Project EASI/ED Common Operating Environment (COE)

This subsection lays out the steps employed to identify and assess potential candidates for early conversion to the Project EASI/ED COE.

Step 1 - Identified candidates for early conversion to Project EASI/ED COE. The Project EASI/ED transition schedule was reviewed to identify the current Title IV systems that will be

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replaced by a Project EASI/ED subsystem in a latter phase of the transition. These systems were evaluated to see if ED might benefit from converting them from their existing technical architecture to the Project EASI/ED COE in an earlier phase. The following factors were considered:

- The long-term value of the Title IV system to ED and to the community.
- The amount of time the system is expected to continue operating.
- The maintenance and contractual support issues associated with maintaining it in its current environment.
- The technical complexity and feasibility of converting the system to the Project EASI/ED COE.

Step 2 - Assessed feasibility and value of early conversion. For each candidate for early conversion, it was determined if converting the Title IV system to the Project EASI/ED COE was feasible and offers significant benefit to ED.

- **Reviewed Project EASI/ED COE.** The *Project EASI/ED COE Document* was reviewed to understand the technology and configuration of the Project EASI/ED COE.
- **Evaluated candidates for early conversion.** Each candidate for early conversion was reviewed to see whether conversion is technically feasible. If the system cannot operate within the Project EASI/ED COE or requires substantial modifications in order to transfer easily to the Project EASI/ED COE, the system was no longer be considered for early conversion.

If conversion was technically feasible, early conversion was assessed for potential benefit to ED. Each candidate was evaluated based on whether the early conversion would provide:

- A higher-level of performance.
- Substantial cost-savings.
- Significantly improved service delivery.

To determine if a system provides one or more of the values listed above, the following were considered:

- The amount of time the system is expected to continue operating.
- Impacts of the Project EASI/ED COE to performance, costs, and service delivery.
- Impacts of the Band Strategy to performance, costs, and service delivery.

Step 3 - Recommended candidates for early conversion. Title IV systems were recommended for early conversion if the impacts to performance, costs and service delivery suggest benefits to

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ED. Subsection 3.5, Early Conversion to the Project EASI/ED COE, presents the results of this analysis.

1.1.6 Develop Project EASI/ED Transition Organization

This subsection describes the steps taken to develop the structure, organizational roles and responsibilities of the TO that will be required to manage and support the planning of the transition and the actual implementation of the transition to Project EASI/ED.

Step 1 - Designed a TO. To manage the transition from current Title IV systems to Project EASI/ED subsystems, a recommended organizational structure was developed along with the roles and responsibilities for such an organization.

Step 2 - Selected organizational structure for the TO. The current organizational structure of SFAP was reviewed and options for an organizational structure for the TO were drafted. These options were discussed with ED and a recommended structure was developed. Section 5, Transition Organization, in the main document, provides a graphic depiction of the organizational structure, a description of the graphic, and the associated strengths and challenges facing the organization.

Step 3 - Defined roles and responsibilities. The roles and responsibilities required by a TO in charge of managing the transition from current Title IV systems to Project EASI/ED subsystems were defined. The roles and responsibilities support program management concepts such as managing risk, controlling changes, and managing internal and external communication. Project EASI/ED TO roles and responsibilities are presented in Subsection 5.2, Roles and Responsibilities.