

Application Development Methodology

The main objective of Enterprise Applications is to design, develop, and maintain quality software. This document outlines the requirements for requesting new systems, which could be vendor supported or homegrown, system change/modification, or system upgrades. The procedures for implementing large systems which impact the core business of the College are different from the procedures followed for system changes, modifications or upgrades.

I. For system changes, modifications or upgrades and departmental application changes the following steps are required:

- A. Request for Service
- B. Analysis
- C. Planning
- D. Design
- E. Coding
- F. Testing
- G. Delivery
- I. Documentation

Request for Service:

For **enterprise wide applications** the user submits a request for service via email or uses the 'Change Management System' available at <https://delphi.tcnj.edu/plsql/pschange>

For **departmental applications** the user submits a request for service at <http://www.tcnj.edu/~dadt/request.html>.

Analysis:

After the request is received and assigned, an analyst investigates the requirements in detail and schedules a meeting with the requestor to learn what data is kept, how it is processed, what information is produced, and how that information is used. After the facts are gathered the analyst evaluates the solutions, determines which planning methodology should be used, and accepts or rejects the request.

Planning:

- For **upgrades** (such as a new vendor developed system or augmentation/enhancement of an existing system) the tasks are delineated, a timeframe is determined and a project plan using MS PROJECT (sample I) is developed. This information is given to the requestor for approval. The project plan will encompass the scope, the required tasks for reports development, customizations of delivered or new processes, conversion of legacy data, migration of converted data to the new system, resource allocations and project time-lines. This information is given to the requestor for approval. Once approved a copy is provided to the members of the technical and functional teams.
- For **system changes and modifications** tasks are delineated and a timeframe is determined, but a project plan and requestor's approval are not necessary.

- For **departmental applications** the tasks are delineated and a timeframe is determined. The scope of the request determines whether a project plan and requestor's approval are necessary.

Design:

- The first step in the design process is to implement the hardware and software environment as required. A separate environment from the production environment is established for development and testing by the technical team. Another environment is also established for the functional users for their testing once the technical team releases the changes for functional testing. System design documents and specifications are developed based on the requirements agreed to by the technical and functional users. Directories are created to store the developed programs and reports.
- Based on the specifications and established naming conventions, the technical team creates new tables, screens/pages and data elements. The technical team develops a database schema listing the table names, field names within the tables, field size, field type, key fields, what information the field will contain and how it relates to other fields. The technical team also develops page layouts to show how the page will look to the user. They will further explain the table name, field name that goes in each field on the screen, what functions (ADD, CHANGE, DELETE, CORRECT) are to be allowed on the screen and how each field is to be handled (editing, lookup, default).
- For new /existing reports, the technical team creates report layouts to show how the completed report will appear to the user. It further explains which table the data element is coming from and how the results are being calculated.
- For conversion programs the legacy data is mapped to the new data structures. The conversion design includes the conversion of all files, databases and data structures to formats used in the new/upgraded system and the creation of any new files and/or databases.

Coding:

Each process is developed according to the specifications received by the technical team.. This involves designing and coding programs and subprograms and creating tables and data elements. Based on the process the test scenarios will be developed by the technical team for unit testing. Output from each process is checked thoroughly before releasing it to the functional users for testing.

Testing:

1. Testing is an important component to ensure that a quality product is delivered to the end users. The basic components that must be tested are programming modifications requested by the user and modifications made to support the mission critical application. Both types of changes require testing of the individual modification as well as proper integration and incorporation within the scope of the enterprise wide system.. These changes need to be applied and tested within a test environment before they are released to the users for functional testing and acceptance. The following are the types of tests needed to support the overall testing strategy:

- Unit Test
- User Test and Acceptance

Unit Test:

The objective of the Unit Test is to ensure that the enhancement meets functional and technical design requirements of the requestor and that all transactions, database updates, and functionality flow accurately. This testing phase ensures the data and unit integrity of all system enhancements.

Units that are not modified or affected in any way by an update/enhancement are not tested during this phase.

Method

The Programmer responsible for developing/applying the changes will design the unit test cases after the development effort which:

- Provides coverage for all the identified functions and logic paths.
- Considers all normal, unexpected, and error I/O conditions.

Data for this test is limited in quantity, but should be created by the programmer and designed to exercise all conditions handled by the programs. Programmer(s) will conduct individual unit test(s). Each test case will be created on an as needed basis based on the conditions to be tested and the expected results. These conditions are defined by the functional requirements. These test cases will be developed documented including:

- Conditions to be tested.
- The expected results to be demonstrated.

User and Acceptance Test:

The User and Acceptance Test are performed after the completion of all application enhancements. It is driven by the business functions of an organization. These are the continuous (and contiguous) set of activities within an organization that ensure that the organization accomplishes its objectives. The goal is to make sure that the system(s) performs as expected across all business functions and departments.

Whereas the Unit Test focuses on Unit affected by enhancements to the system, the User Test and Acceptance Test focuses across all departments, whether modified or not. This test will:

- Test the functionality
- Ensure that all basic business transactions operate as defined by the functional requirements
- Test system configuration settings

The main objective is to be reasonably assured that the application systems are ready to be used in the production environment. The focal point is to test that the system functions as designed. These test cases must be defined prior to performing the system test.

User test case designs describe the details of the business process including the following information:

- Conditions to be tested
- Test preparation (prerequisites)
- Execution procedures
- Expected results
- Action taken (in case of failure)
- Test cases, scripts and test data documentation
- Entry and exit criteria

The test scenarios are created by the Functional users (Business Analyst). If required the Technical Team assists the Business Analyst in developing these scenarios. Each scenario is tested by the functional users. The failure of a scenario or part of a scenario requires the technical team to retest the entire process.

This test is conducted in an instance created for user testing. The data used is a copy of production data.

Delivery:

In this phase the College is made ready to accept the new system by training the end user community in the functional and technical skills needed to understand the new application and its business processes and by preparing post-implementation support.

This system is designed and developed with state of the art technology and can be used campus wide. It also meets all the requirements of the users as specified in the 'Request for Service' phase.

During this phase the project team will develop and document Disaster Recovery and Backup plans to support the system in production.

The system is moved to the production environment and access is granted based on the new business processes.

The old system is phased out. However, user access to the legacy system should be maintained for reporting on historical data until it is converted to the new system.

Documentation:

The functional and technical users are responsible for documenting all the deliverables.

The functional areas will provide the following:

- **User Manual** – defines system navigation and how to use all the new procedures.
- **Test Scenarios** – describe the different conditions within a process to be used during testing.

The technical team will provide the following system design specifications:

- **Technical design of all processes designed and developed.**

- **Database Schema** -- table name, field names within tables, field type, field size, is field keyed, what information the field will contain, how it relates to fields in other tables.
- **Page Layouts** - Shows the user how the screen looks. Explain which table_name.field_name goes in each field on the page, what functions (ADD, CHANGE, DELETE, QUERY) are to be allowed on the screen, how each field is to be handled (editing, lookups, etc.), security levels associated with the screen, etc.
- **Menu Scheme** - Shows what options will appear on each system menu, what submenu or screen each option selects, the order the menus are to appear, any security issues associated with the menus.
- **Program Specifications** - Shows what data is used in the program and from where it comes. Detail any calculations, editing or extraneous updating to be performed. Explain how and at what point in the system this program executes.
- **Report Layouts** - Show how the completed report will appear to the customer. Explain where each item of data comes from or how it is calculated. Explain how the data is to be sorted, where the heading or subtotal breaks are.
- **Infrastructure diagram** -- Shows what hardware devices are to be used. Shows which hardware devices are to connect together. Explains connections that are to be direct connect or network connections. Shows what operating systems will be used on each device, and what protocol, emulation, customer interface or other software is to be available and for what purpose.

II. For new vendor developed systems which replace existing campus wide applications steps A through C are more complex but steps D through I remain the same.

Request for Service:

A written request is submitted by a department head to the Associate Vice President of Information Technology. This request outlines the requirements of a new system. After the request is received the Associate Vice President of Information Technology will submit the request to the Cabinet for acceptance or rejection. Once the Cabinet approves it a feasibility study is conducted which includes a determination of the projects potential to produce results which will benefit the College in a cost effective way, an estimation of hardware and software needs, an investigation of potential vendors and the selection of a partner for system development. Once the feasibility is determined the Associate Vice President will submit the request to the Board of Trustees. If approved the request enters the planning stages.

Analysis:

The purpose of the analysis is to define and communicate the goals and objectives that will steer the project. A steering committee is created to oversee the project. The committee includes members from the affected areas and Information Technology.

The analysis is performed by the requestor and Information Technology in conjunction with the vendor selected. A project charter is created which reflects the scope of responsibilities of all project parties, their roles and availability, and associated levels of authority. The charter also determines whether the schedule is viable for the scope of the project and outlines a formal crisis resolution process. A project plan to reflect the scope, the phases, the required tasks, resource allocations and time-lines is developed.

Planning:

In the planning stage the selected implementation partner and the project team review the new applications as well as the business processes of the College to determine the fit between the business requirements and the software application capabilities. If a gap is identified then a decision is made to reengineer or modify the business process.

After the 'Fit/Gap Analysis' is completed a prototype is constructed which includes all associated development project such as interfaces, reports, modifications and conversion of historical and legacy data.