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ANALYSIS AND IMPLEMENTATION OF AN ASSURANCE OF LEARNING SYSTEM FOR THE
CAMERON SCHOOL OF BUSINESS

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Executive Summary

The Assurance of Learning program (AOL) was created by the Association to Advance Collegiate Schools of Business (AACSB) to aid schools in providing continuous improvement in their curricula thus enhancing students' learning. Being recognized as an AACSB accredited school equates the school with quality. The accreditation conveys to the public that the school is proactive in helping its students excel by modifying their curricula to reflect the changing times.

The AACSB has set requirements schools must adhere to in order to be affirmed or reaffirmed as accredited institutions. These requirements dictate that a school must select one of three forms of assessing student learning trends; entrance selection, course-embedded assessments, or stand-alone assessments; and to formally document the processes to exhibit and communicate that they are conducting student learning assessments' in a clear, concise, and uniform manner. For the purposes of AOL at University of North Carolina Wilmington Cameron School of Business (UNCW CSB) student learning assessments are evaluated through stand-alone assessments.

To retain AACSB accreditation, the UNCW CSB AOL program needed a consistent reporting system to report the assessment results to the AACSB. The UNCW CSB AOL program also needed a formal documentation for administering learning goal assessments and collecting the results of the assessments. To address these needs, a systems analysis was conducted of the UNCW CSB AOL program. The systems analysis consisted of: conducting stakeholder interviews to understand the stakeholders' concerns, creating the project charter to establish the project's purpose and scope, conducting a process analysis to document the AOL processes, creating the actor diagram to establish the roles and responsibilities of stakeholders, creating the context diagram to illustrate how all entities interact with the AOL system,

conducting a use case analysis to test the system when completed, and creating prototype charts for the reporting system.

The investigation revealed that a data warehouse would be ideal storage for the assessment data, AOL system diagrams did not exist and needed to be created, and the AOL processes needed to be formally documented to ensure assessments were performed and analyzed in a consistent manner.

To address these needs a data warehouse was constructed to store the data, transform and load data from a third party, and provide standardized reports. In addition, system and process diagrams were created to formally document the AOL program at UNCW CSB. Three business grade tools were used to implement the data warehouse: Microsoft SQL Server, Microsoft Reporting Services 2005, and SQL Server Integration Services (SSIS). Reporting Services was employed to generate parameterized chart templates to ensure consistent reporting. SSIS was engaged to create an extract transform load to ensure data from third party assessments conformed to the format of the database. And SQL Server was used to generate stored procedures that would query the data and manipulate it for data entry and reporting purposes. Also, a web interface was created to integrate the Reporting Services and SSIS functionalities to simplify the process of data entry and modification.

The success of the project was measured by metrics concerned with the reduction in time spent on assessment data analysis and reporting as well as the level of satisfaction of stakeholders post implementation of the solutions outlined in the project plan. Time spent on data analysis and reporting was reduced overall by 82.62%. The level of satisfaction of the stakeholders was 99.7%. The final system save time and improves information quality.

The paper is broken into two sections: Project Proposal and Project Execution. Part I: Project Proposal contains information relating to the purpose of AOL, the systems analysis of the UNCW CSB AOL system already in place, and the project plan. Part II: Project Execution contains information relating to the execution of the project, how the end product differs from the project plan, the measured success of the project, and what was learned during the experience.

Part I:

PROJECT ANALYSIS

1 Motivation for the AOL Data Warehouse

This document details the design and implementation of a project build a data warehouse for the Assurance of Learning program (AOL) at the University Of North Carolina Wilmington (UNCW) Cameron School Of Business (CSB), and to provide documentation for the Assurance of Learning system and processes used in the program. The project originates from UNCW CSB's need for a consistent reporting system for the AOL to retain Association to Advance Collegiate Schools of Business accreditation (refer to section 4.2.1 Problem). The AACSB mandates that the AOL program provide proof of administering learning goal assessments and collecting results of the assessments in a consistent manner, and to compile an annual report of the assessment results to AACSB.

1.1 Assurance for Learning

The Assurance of Learning Program was created by the Association to Advance Collegiate Schools of Business (AACSB) to aid schools in providing continuous improvement in their curriculums thus enhancing the students' learning (AACSB, Accreditation Standards). Being recognized as an AACSB accredited school conveys to the public that the school is proactive in helping its students excel by modifying their curriculums to reflect the changing times. The AOL program helps with this goal by sampling an accurate cross section of student knowledge, assessing the outcomes with a measurement tool such as a rubric, and interpreting the outcomes to define recommendations for continuous improvement of student learning. The outcomes and recommendations are annually compiled into a report (required by the AACSB) and submitted to the AACSB for affirmation or reaffirmation of the AACSB accreditation.

1.2 Cameron School of Business Assurance of Learning Plan

“Assurance of Learning at the Cameron School of Business means: A clearly defined process to continually improve the learning outcomes of skills, knowledge, and perspective for all business students to better prepare them for the ever changing business world in which they will work” (Business).

Student learning is one of the primary goals of UNCW. The goal is echoed in the mission statement: “[the] school seek[s] to simulate intellectual curiosity, imagination, critical thinking, and thoughtful expression” within its students (Business 5). Adhering to the mission statement, CSB has invested heavily in educating the faculty and administration about the AACSB AOL program (Business 5). UNCW CSB instituted the AOL program based on the framework provided by the AACSB (see section 1.3 AACSB Assurance of Learning Standards below). Also, in accordance with the AACSB Assurance of Learning Standards, UNCW CSB constructed learning goals, or statements declaring the educational aspirations of the program. Separate goals were created for each program: undergraduate, and graduate (with the graduate program goals broken down for each of the various degrees).

For the purpose of this project, we will only focus on the undergraduate program’s goals. Refer to the Cameron School of Business Assurance of Learning Plan for the complete list of the Undergraduate Program Goals (Business). This project helps accomplish the undergraduate learning goals by providing statistical data from the assessments to identify learning trends and opportunities for improvement. The project will also provide documentation of the program’s structure and the processes for administering, collecting, and interpreting the data.

1.3 AACSB Assurance of Learning Standards

The AOL program is designed to not only support students’ learning through improvement of curriculums, but to also demonstrate accountability for aiding students’ learning. Schools are to be held responsible for offering students an education that ultimately prepares them to work in the current job market. AACSB created a set of standards for the schools to follow in order for them to achieve or reaffirm accreditation. The standards mandate that participating schools must:

- Define learning goals and objectives
- Align the learning goals and objectives with the schools’ mission statements
- Identify the instruments used for measurements and measurement criteria for the learning goals
- Collect, analyze, and disseminate the results

- Use results for continuous improvement of curriculum
- Document the assessment process to ensure assessments are carried out in a consistent manner

This project will address the 3 latter criteria set forth by the AACSB: handling data, documentation of processes for the AOL program, and applying the data to achieve continuous improvement of curricula.

For further discussion on the AACSB Assurance of Learning Standards refer to the AACSB web site:

< http://www.aacsb.edu/resource_centers/assessment/standards.asp>.

The AACSB provides 3 approaches to implementing an AOL program:

- Selection, schools admit “students into a program on the basis of knowledge or skills expected of graduates of a degree program (AACSB, Accreditation Standards);”
- Course-embedded measurement, exposing students, in required courses, to “[methodical] learning experiences [intended] to produce graduates with a particular knowledge or [skill set] (AACSB, Accreditation Standards);” and
- Demonstration through stand-alone testing or performance, where students submit a piece of work or are tested in certain knowledge or skills required to graduate or advance (AACSB, Accreditation Standards).

2 Importance of Assurance of Learning

2.1 Accreditation

An AACSB accreditation is often equated with quality for business schools worldwide. Having the accreditation “is a clear indicator not only of quality, but of instructional commitment to a philosophy of continuous improvement (Bouverat).” The Assurance of Learning program will demonstrate UNCW CSB’s commitment to quality education and continuous improvements to enhance student learning. To retain AACSB accreditation, UNCW CSB must document the processes to exhibit and communicate that they are conducting the assessments in a clear, concise, and uniform manner. This project encompassed

documenting the AOL processes to meet these expectations as well as developing the data warehouse to store the data.

2.2 Continuous Improvement of Curriculum

Curriculums adapt over time, whether it is due to direct changes to the curriculum or due to indirect changes from outside forces. The AOL program provides a way for UNCW CSB to track changes and their effects on students' learning. For example: if UNCW CSB implements a new mandatory writing course in its curriculum the AOL assessment will illustrate the impact of students' learning. Depending on the outcome, UNCW CSB could keep the course and refine it if the impact was positive, or remove the course if the impact was insignificant or negative. However, an indirect change in students' learning may stem from something as simple as the College Board employing more stringent requirements for writing on the SAT. Having the College Board require a higher standard of writing skills will ultimately improve the written communication scores for UNCW CSB since incoming students will already be proficient in writing. Because of this, UNCW CSB will be able to change the status of a writing course already mandated from required to an elective and replace the writing course with another business course.

3 Importance of Project

This project provides tools to support better decision making. This stems from five benefits resulting from the project: documentation, consistency, accuracy, quality, and efficiency. The benefits are described in full detail below.

3.1 Documentation

Documentation is necessary for all processes related to AOL: disseminating, gathering, and assessing learning goals for the undergraduate program. Accurate documentation of the processes is needed to adhere to the requirements set forth by the AACSB, and to provide standards for the faculty and

administration to follow when dealing with assessments. The standards that come with the documentation assist with providing consistency, accuracy, and efficiency.

3.2 Consistency

Consistency is derived from the faculty an administration following the standards set forth in the documentation. The AOL assessments need to have consistent procedures to ensure data is gathered and reported in exactly the same manner every semester. Consistency is also be provided by a common database and standard reports. The common database consolidates the assessment results and guarantees the data is in a consistent format, while parameterized chart templates are used to generate the reports in a uniform manner. Any deviation from the procedures or specified tools, and its impact on the AOL program, will need to be fully documented.

3.3 Accuracy

Since everything is gathered and reported in a consistent manner the measurements of the assessments, by default, are more accurate. The accuracy has improved because all measurements are relevant and therefore can easily be compared. Furthermore, the protocols for delivering the assessments alleviate the negative effects that stem from an assessment giver's apathy. In the past it has been noted that a student's performance is linked to the attitude of the assessment giver. The more apathetic an assessment giver is, the less likely a student will apply themselves to the best of their ability, thus lowering the overall scores and giving a false indicator of a need for improvement.

3.4 Quality

The project produces reports that allow decision makers of various levels to drill down. For example, the generic report only illustrates the semester and average score for the learning goals. However, that report will be able to be broken down by outcome and course. This is very important since it will help pinpoint areas in need of improvement. Consider this scenario: the written communication assessment is given to a finance course, an economic course, and an information systems course. The

outcomes indicate that the information systems course's average is lower than the other courses. Drilling down in the report allows a decision maker to discover that only one particular course performed below par. With this information the decision maker can launch an investigation to find out why this particular course is lagging behind the learning goal and rectify the issue.

3.5 Efficiency

Prior to the project, assessment outcomes were not reported in a uniform manner. This led to numerous hours spent trying to decipher the reports of assessment outcomes. This project provides a common source and format for reports. By reducing the formats used to assess and measure learning goals, this project increased the speed at which the information is processed. Instead of hours searching for underlying commonalities in the reported outcomes and subsequently entering the data, the UNCW CSB AOL administration needs only minutes to review the outcomes and entering in the data. Additionally, the UNCW CSB AOL administration is to produce standard and ad hoc reports expeditiously.

Reporting Services 2008 was utilized to generate parameterized charts. Using Reporting Services eliminates the manual creation of charts and immensely reduces the time spent on report creation. Charts can be created by clicking one of "Reporting Services" buttons on the user interface of the AOL Access project and selecting the desired chart link. Stored procedures use parameter values, provided by the user, to generate ad hoc reports. Refer to section 7.1.4 Charts for more details.

4 Systems Analysis

4.1 Stakeholder Interviews

For this project a small sample of the stakeholders were interviewed to discover their needs, wants, and concerns regarding the AOL Program. The selected stakeholders interviewed were:

- Dr. Rebecca Porterfield (AOL Committee Chair),
- Terrey Hatcher (AOL Administration), and
- Dr. Thomas Janicki (CSB Faculty).

Each stakeholder was interviewed in their office with a time limit of one hour. Questions for the interviews were prepared and agreed upon by the Capstone Committee prior to the actual interviews. Below is a synopsis of the interviews highlighting the critical concerns of each interviewed stakeholder. For a full list of questions and answers from the interviews refer to Appendix C.

4.1.1 Dr. Rebecca Porterfield

- Objectives of AOL

The AOL Program needs to have the ability to track trends in student learning through the use of quality control charts. The trends identified in the charts highlight areas of improvement, and therefore aid in improving student learning at UNCW CSB. The program also needs to develop a consistent protocol for gathering and disseminating data.

- What AACSB is requiring

The AOL Program needs to adhere to the criteria issued by AACSB. The criteria are listed on the AACSB website <http://www.aacsb.edu/resource_centers/assessment/standards.asp>.

- Types of charts to be generated

The charts generated by Reporting Services 2005 for the AOL program must reflect the needs of the AOL Committee and AACSB. The AOL Committee and AACSB need to see trends of student learning overtime. The AOL Committee also needs to see different levels of detail regarding the data.

4.1.2 Terrey Hatcher

- How the data is collected, extracted, and used

The data collected from assessments must be easily accessible and manipulated. With the current state of the system, for one assessment instance (one course for one semester) it takes an average of 1-3 hours for data organization, 1-3 hours for data entry, and 2-5 hours for generating the necessary

charts and reports. That totals 7 hours, on average, per assessment instance. The AOL program at UNW CSB consists of 8 different assessments. This accrues to approximately 56 hours (7hrs * 8 assessments) spent on AOL assessments each semester. Also, the data used for the creation of the annual reports needs to be segregated from the grades students earn. Students should not be graded based on their assessments.

- How the reports are used

The annual reports generated by the AOL system are used to establish the trends in the learning goals and the actions taken to improve student learning.

- Needs of the AOL system

The UNCW CSB AOL Program needs to address the criteria set forth by the AACSB. The criteria issued by the AACSB are listed on their website

<http://www.aacsb.edu/resource_centers/assessment/standards.asp>.

4.1.3 Dr. Thomas Janicki

- Consistency

One of the main issues of the AOL Program at UNCW is consistency. Previously, there were no set standards for the notification of assessments, administering of assessments, or collecting the outcomes of assessments. Creating these standards helped alleviate frustration and apathy for the faculty impacted by the AOL Program as well as provide more accurate outcome values for the annual reports.

4.2 Project Charter

Project charters are documents that establish the purpose, scope, objectives, and participants of a project. These documents are considered best practice and are used to obtain authorization for a project and/or as a focal point for the project team to eliminate expanding scopes. The project charter for this project documents the problem the project addresses, the scope, the stakeholders, the objectives, the constraints that inhibit the project, the milestones, and the resources for completion of the project. Below

are the critical aspects of the AOL data warehouse project charter. For the full project charter refer to Appendix D. The project charter for the project was approved by the Capstone Committee, then by the AOL Administration in October 2008.

4.2.1 Problem

The problem addressed by this project is that the Cameron School of Business needs a consistent reporting system for the Assurance of Learning reports for the AACSB accreditation. The AACSB mandates that the AOL program delivers annual reports of the learning goal outcomes and that these reports must be produced in a consistent manner to accurately illustrate trends overtime.

4.2.2 Business Objectives

The business objectives of the project are:

- Utilize AOL to improve student learning,
- Be able to have longitude tracking through the use of quality control charts,
- To be able to identify areas of improvements based on the charts,
- To have consistent reporting, and
- To have a web presence on the CSB website.

4.2.3 Scope

The scope of the project was limited to the AOL program for the undergraduate level at UNCW. The graduate level will be omitted because the learning goals for the graduate program are inconsistent throughout the various degrees. It would be extremely time consuming to restructure the learning goals of the graduate degrees to be uniform and comparable. For a full detail of the project scope refer to section 6.1 Project Plan.

4.3 Actor Diagram

4.3.1 Actor Diagram System Components

An actor diagram “defines the needs and intentional relationships of the actors (users) of a system.” (Cervanka) Actor diagrams consist of system components (usually in the middle of the diagram) and the actors (on the outer rim of the diagram). Actors are people or things (such as another computer system) that interact with a system. (Satzinger) The components of a system in an actor diagram represent the pieces of the system that actors will interact with.

The system for the AOL Program is comprised of several components: reporting, data entry, extract transform load, and manual rubrics. Refer to Figure 1. The project focused on the reporting, data entry, and extract transform load components, a description of all of the components of the system are listed below.

The actor diagram for this project was approved by Dr. Douglas Kline, then by the AOL Administration in October 28, 2008.

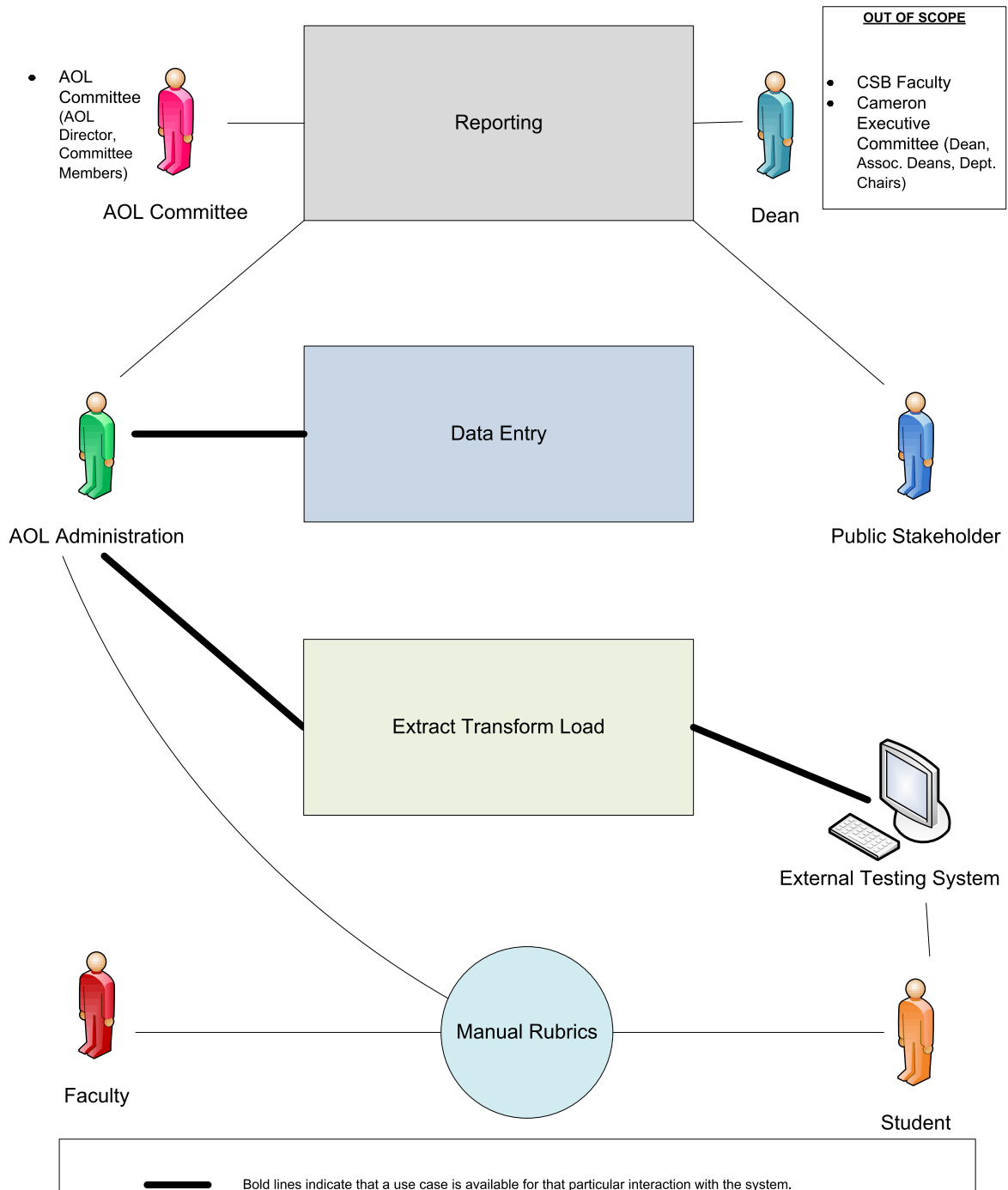
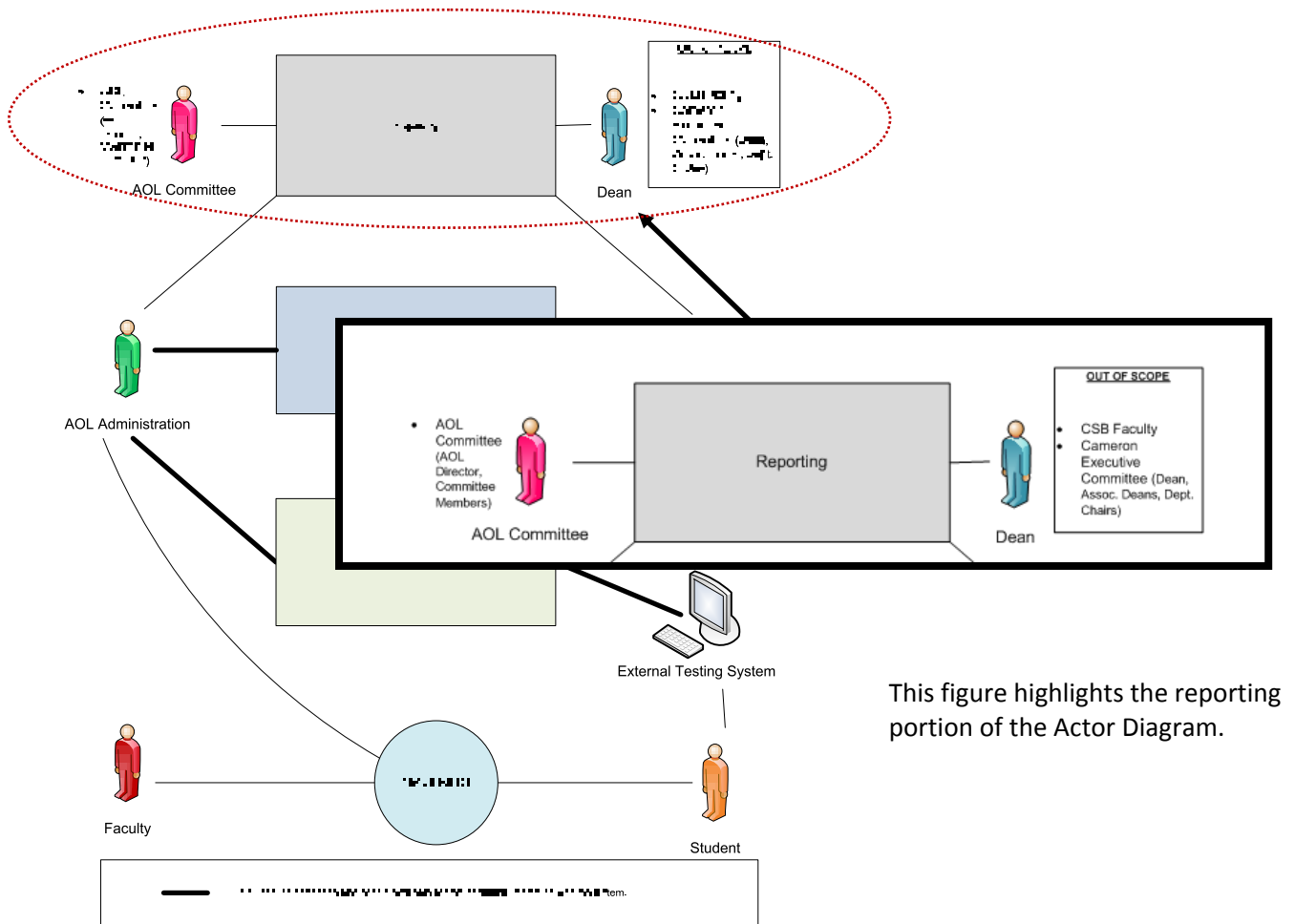


Figure 1 Actor Diagram

4.3.1.1 Reporting

SQL Reporting Services 2005 is a server-based reporting environment that allows users to create predetermined charts, as well as ad hoc charts. Several standard, predetermined queries are created to be

used to generate the most frequently used charts. This automation reduces the time the AOL administration spends on generating charts. For scenarios in which the AOL administration needs to create a chart that is not standard, they will employ the Report Builder feature of Reporting Services. The Report Builder feature walks users through choosing templates, chart layouts, data selection, etc to create the desired reports and charts. Having a user friendly environment also helps eliminate the majority of the time spent on creating reports and charts. In addition to the ease of creating the charts, all of the charts have drill down capabilities. Being able to drill down into the reports is essential in helping the AOL administration make better decisions regarding student learning. With drill down capabilities they will be able to isolate issues more accurately versus groping in the dark for the origins of issues.



This figure highlights the reporting portion of the Actor Diagram.

Figure 2 Reporting section of the actor diagram

4.3.1.2 Data Entry

Currently the AOL program is operating on an Access 2007 project as the user interface, connected to SQL Server as the database management system. For the data entry component of the AOL system, we will continue to employ Access 2007. Access 2007 is relatively simple to understand and a familiar environment for the AOL administration. These features are imperative to the continual operation of the AOL program. Using a familiar and simple environment allows the program to function in the event key personnel leave the committee and/or the university. Someone can be easily brought up to speed and resume the activities of whoever left without interrupting normal operations. The AOL program will be able to assess learning goal outcomes and generate annual reports in a consistent manner.

Access 2007 also makes data entry virtually effortless. The AOL Access 2007 project uses the form feature as a user interface for data entry. Users click on radio buttons associated with the outcome values of learning goals. Refer to Figure 3 and 4 below.

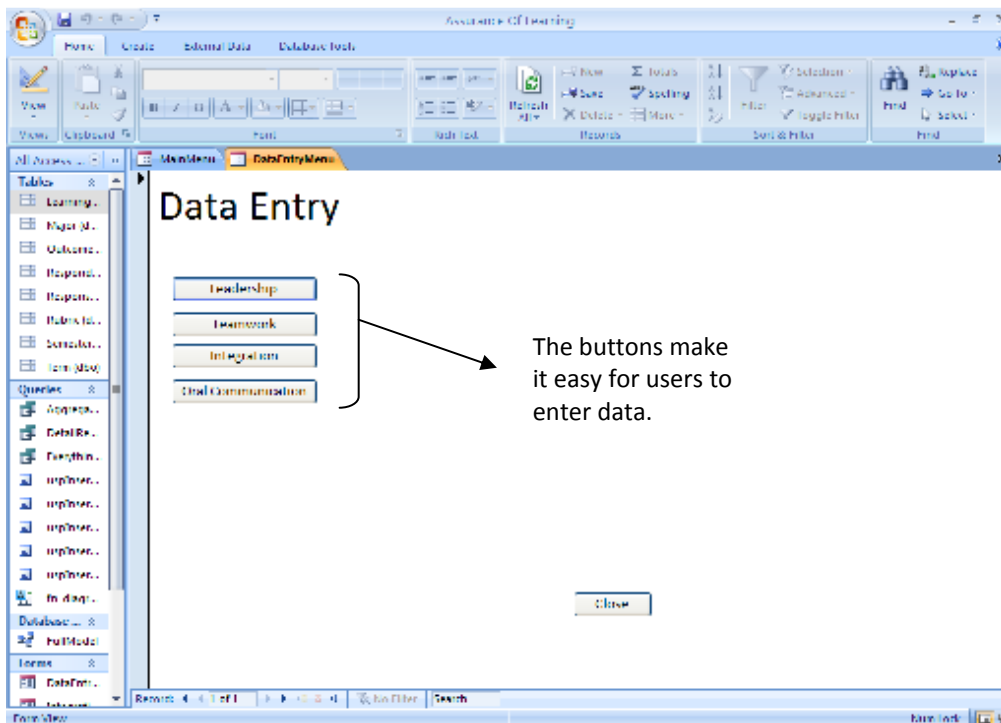


Figure 3 User friendly form for data entry

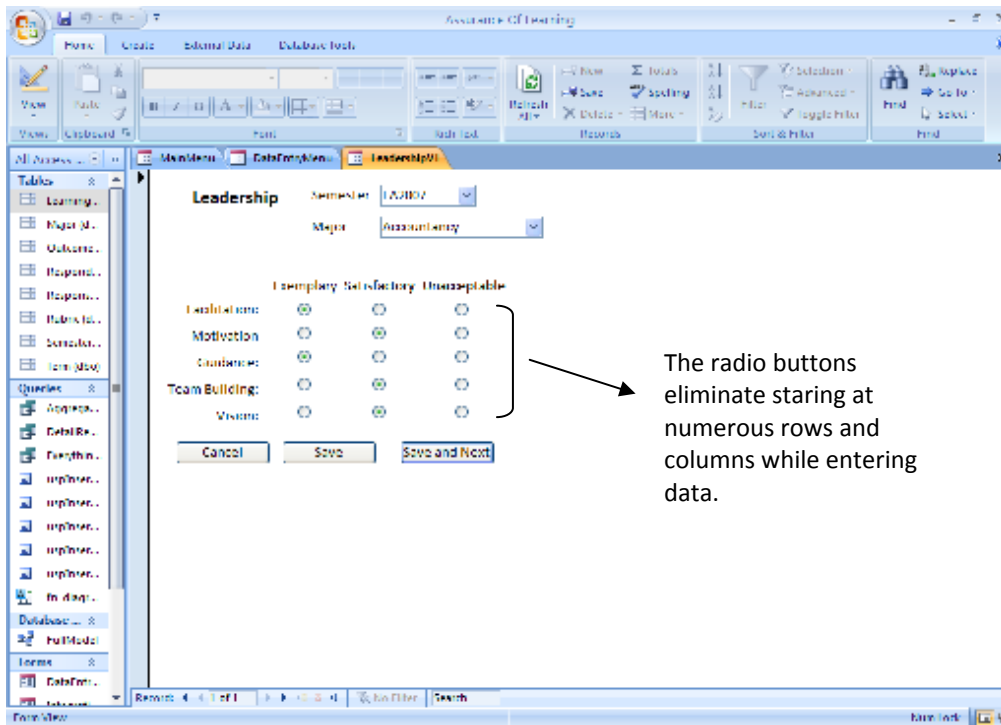
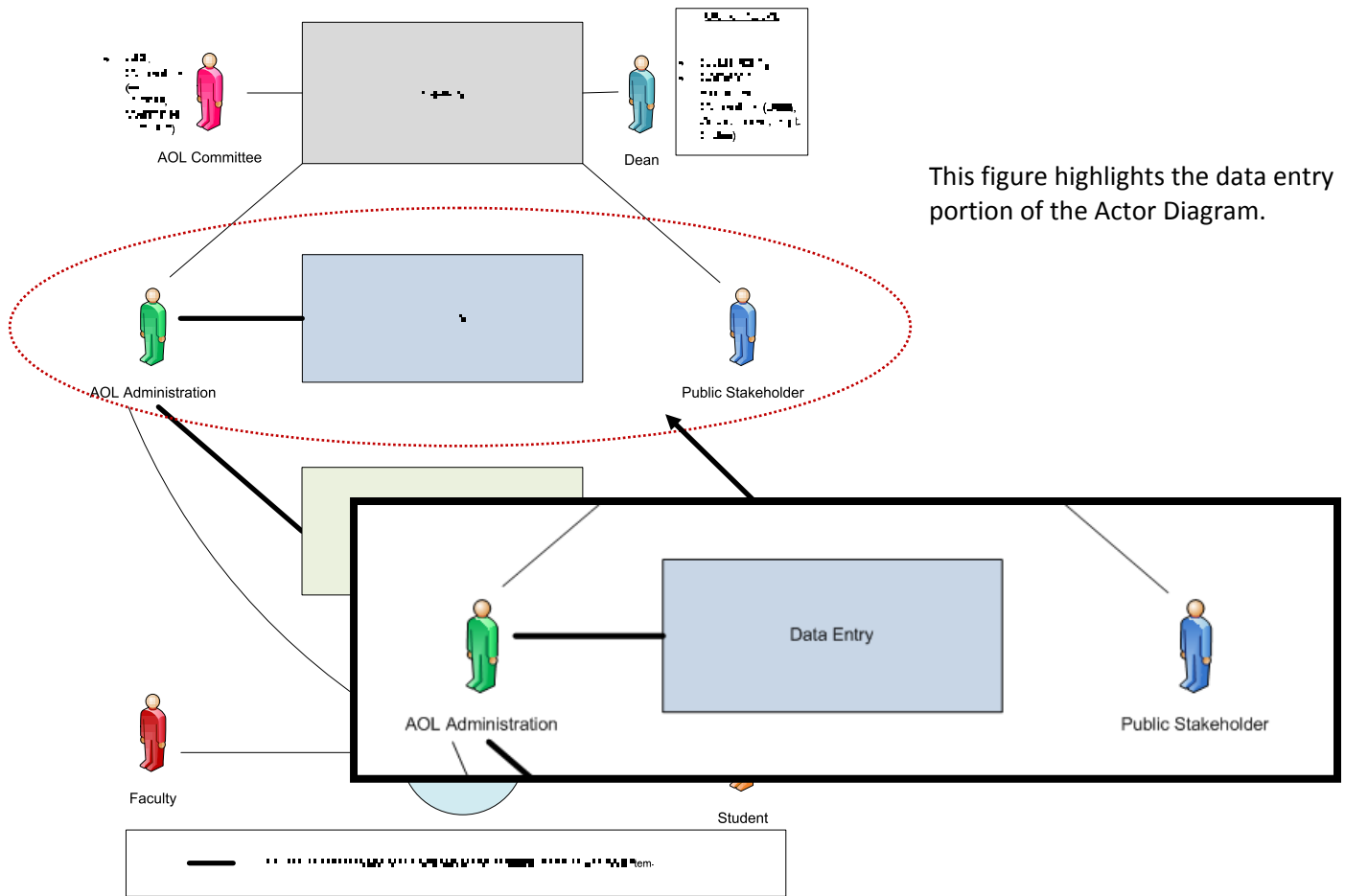


Figure 4 Radial buttons used for data entry



This figure highlights the data entry portion of the Actor Diagram.

Figure 5 Data Entry section of the actor diagram

4.3.1.3 Extract Transform Load

The extract transform load component of the system migrates data from an Excel file to the AOL database. Traditionally ETLs extract data from one data base and import it into a target data base. For this project, the ETL extracts data from an Excel file, because the AOL program uses third party vendors for some of the assessments and UNCW CSB does not have access to the third party vendors' databases. Because UNCW CSB does not have access to these databases, some manual effort is required to extract the data. The AOL administration has to manually visit the third party's web site and export the data into a CSV file. Once the data is transferred to an Excel file, the ETL grabs the data (extract), transform it into a uniform format (transform) and insert it into the AOL SQL Server database (load).

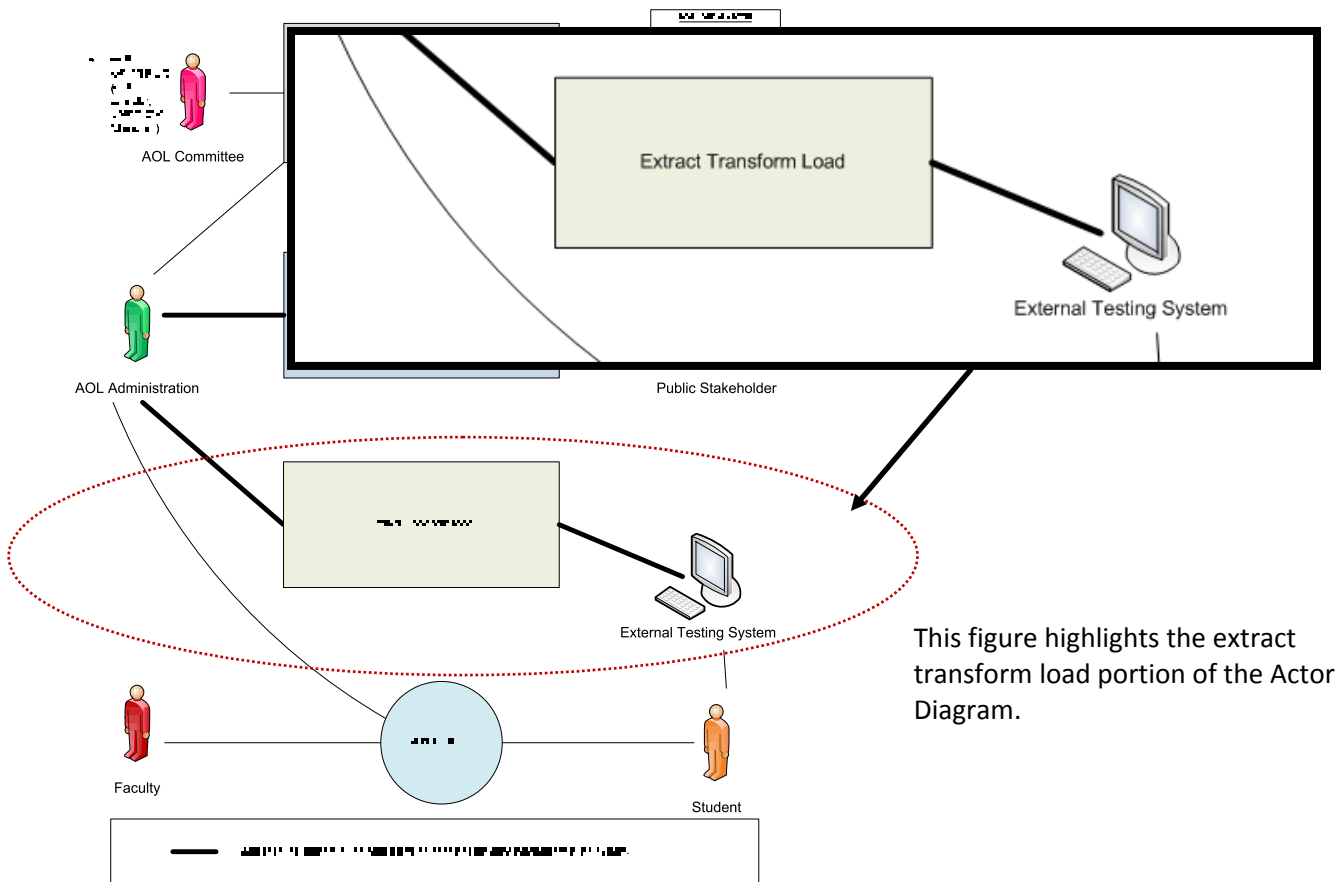


Figure 6 Extract Transform Load section of the actor diagram

4.3.2 Actors/Roles

As mentioned earlier, actors are people or things that interact directly with a system. In the chart below the actors and their rights in the AOL system are defined. It is important define who/what interacts with a system and their abilities within a system since an actor diagram does not show the specifics of the interaction only a general interaction represented by a line connecting the actor to the system.

	<u>Rights</u>										
<u>Actors</u>	Data entry	Generate reports	Generate charts	Drill down capabilities in charts &	Extract data from 3 rd party vendors	Create stored procedures	View charts	View reports	Provide assessments	Grade assessments	Take assessments
AOL Administration	√	√	√	√	√	√	√	√			
AOL Committee				√			√	√			
Dean				√			√	√			
Public Stakeholder							√	√			
Student							√	√			√
CSB Faculty							√	√	√	√	
External Testing System									√	√	
Cameron Executive Committee				√			√	√			

4.4 Context Diagram

A context diagram illustrates the external entities that interact with a system and the relevant information flows between a system and its external entities (Students). In essence, context diagrams are graphical representations of use cases (possible scenarios of interactions with a system) because they illustrate the flow of data. Use cases are defined in fuller detail in section 4.5 Use Case Analysis below.

The context diagram for the AOL system shows the system interacting with 9 distinct external entities (the stakeholders, the UNCW system, and the ETL system). These entities are represented by squares while the AOL system is represented as a circle (refer to Figure 7). The data that travels through the system is represented by arrows (refer to figure 8) with text labels defining what the data is. Refer to Appendix E for the full version of the context diagram.

Each of the context diagrams generated for the project were approved by Dr. Bryan Reinicki on November 18, 2008.

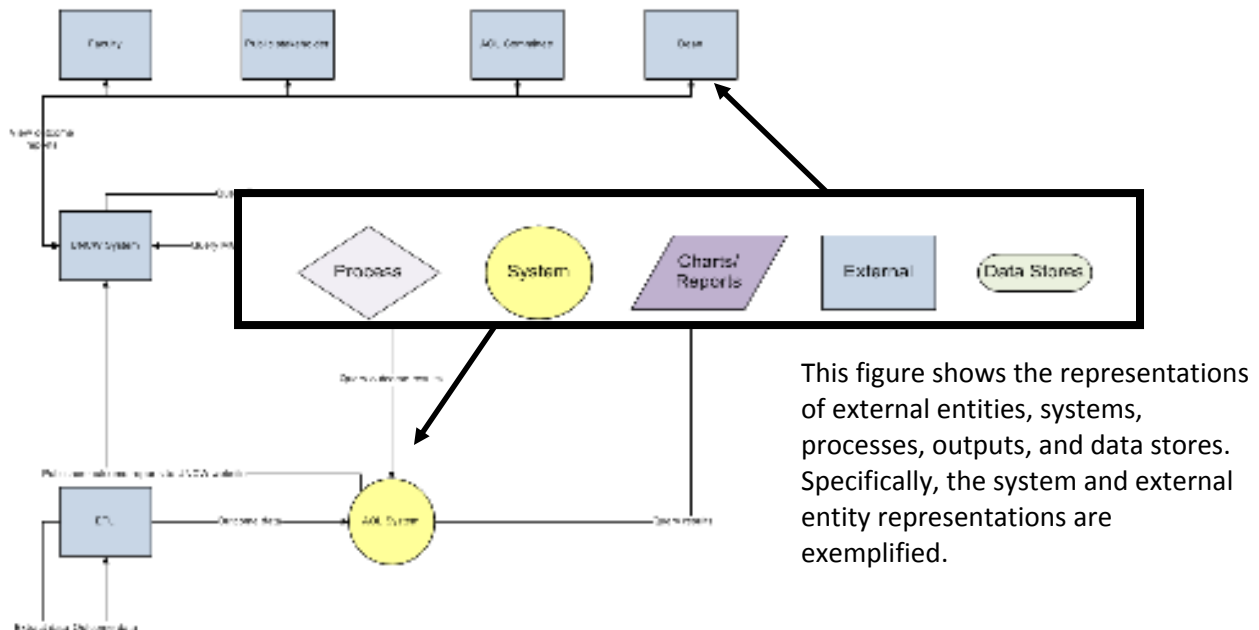


Figure 7 Legend for the context diagram

Each of the use cases generated for this project were approved Dr. Bryan Reinicke November 18, 2008.

The format used for use cases in this project is the formal approach. This approach lists every detail of the scenario. Typically formal use case templates contain the sections:

Detail

- Use Case Name
- Scenario

- Triggering Event
- Brief Description
- Actors

- Related Use Cases

- Stakeholders

- Preconditions

- Post Conditions

- Flow of Events

- Exception Conditions

Description

- The title of the use case
- The task the actor/user is trying to accomplish.
- What instigates the need for the scenario.
- A synopsis of the events of a use case.
- The external entities that interact with the system in the scenario.

- Use cases that pertain to the task being accomplished in the use case.

- A person, group, organization, or system that has a vested interest in the scenario
- Conditions that must be met before the scenario may take place.
- Conditions that must be met after the scenario takes place.

- The steps taken by the actor and the system to perform the task.

- What happens if an alternative path from what is specified in the flow of events is taken.

The example below shows the Data Entry use case. The use case explains in full detail how an AOL administrator takes the outcome results from an assessment and inserts the data into the AOL database. In this particular case the outcome results that the AOL administrator is entering into the database are Leadership outcome results. This does not mean that this use case only applies to entering Leadership outcome results. Any faculty-administered assessment may be entered into the database in the same manner. The Leadership assessment is only used as an example for similar situations.

All of the use cases are presented in full in Appendix H.

Use Case Name	Data Entry	
Scenario	AOL administration entering in outcome results into the AOL database.	
Triggering Event	The AOL administration receives outcome results from Leadership assessment after the faculty has administered the assessment.	
Brief Description	A faculty member has graded the Leadership assessment and gives the results to the AOL administration. The AOL administration logs into the AOL database, chooses the data entry option, and enters in the data.	
Actors	AOL Administration	
Related Use Cases	None	
Stakeholders	AOL Administration: to verify that the data content entered is correct AACSB: the annual report	
Preconditions	The Leadership learning goal must exist. A course has taken the assessment. The faculty member has graded the assessments. The AOL database exists.	
Post-conditions	The data must be associated with the correct learning goal. The AOL database must be updated.	
Flow of Events	Actor	System
	<ol style="list-style-type: none"> 1. Logs into the AOL database. 2. Clicks on the “Data Entry” button. 3. Clicks on the “Leadership” button. 4. Chooses the semester that corresponds with the data from the “Semester” drop down menu. 5. Chooses the major that corresponds with the course that took the assessment from the “Major” drop down menu. 6. Clicks on the radio button that corresponds with the appropriate score. 7. Clicks the “Save and Next button.” 8. Reiterates through steps 6 and 7 until the last outcome result. Here the AOL administrator clicks on the “Save” button. 9. Exits out of the AOL database. 	<ol style="list-style-type: none"> 1. Verifies login information is correct. 2. Redirects the actor to the data entry home page. 3. Redirects the actor to the Leadership entry page. 7. Inserts the data into the database. 8. Inserts the data into the database then redirects the actor to the data entry home page. 9. Exits.
Exception Conditions	<ol style="list-style-type: none"> 1. If the actor uses wrong login information the system will display an error message and not let the actor login. 2. If the actor clicks the “Report” button he/she will be redirected to the Report home page. 3. If the actor clicks another learning goal’s button he/she will be redirected to the data entry page for that learning goal. 4. If the actor does not select a semester no semester information will inserted into the database. 	

	<p>5. If the actor does not select a major no major information will inserted into the database.</p> <p>7. If the actor clicks the “Cancel” button the information will not be inserted into the database and the actor will be redirected to the data entry home page.</p> <p>9. If the actor does not exit the AOL database he/she can enter in more data or generate reports.</p>
--	--

4.6 Documentation of Processes

Swim lanes are a graphical representation of the processes involved in a system. They consist of “lanes” for each actor involved in the process; with the actions performed by the actors in their respective lane, and a time frame for the entire process (refer to Figure 9). Swim lanes were created for each of the undergraduate learning goals:

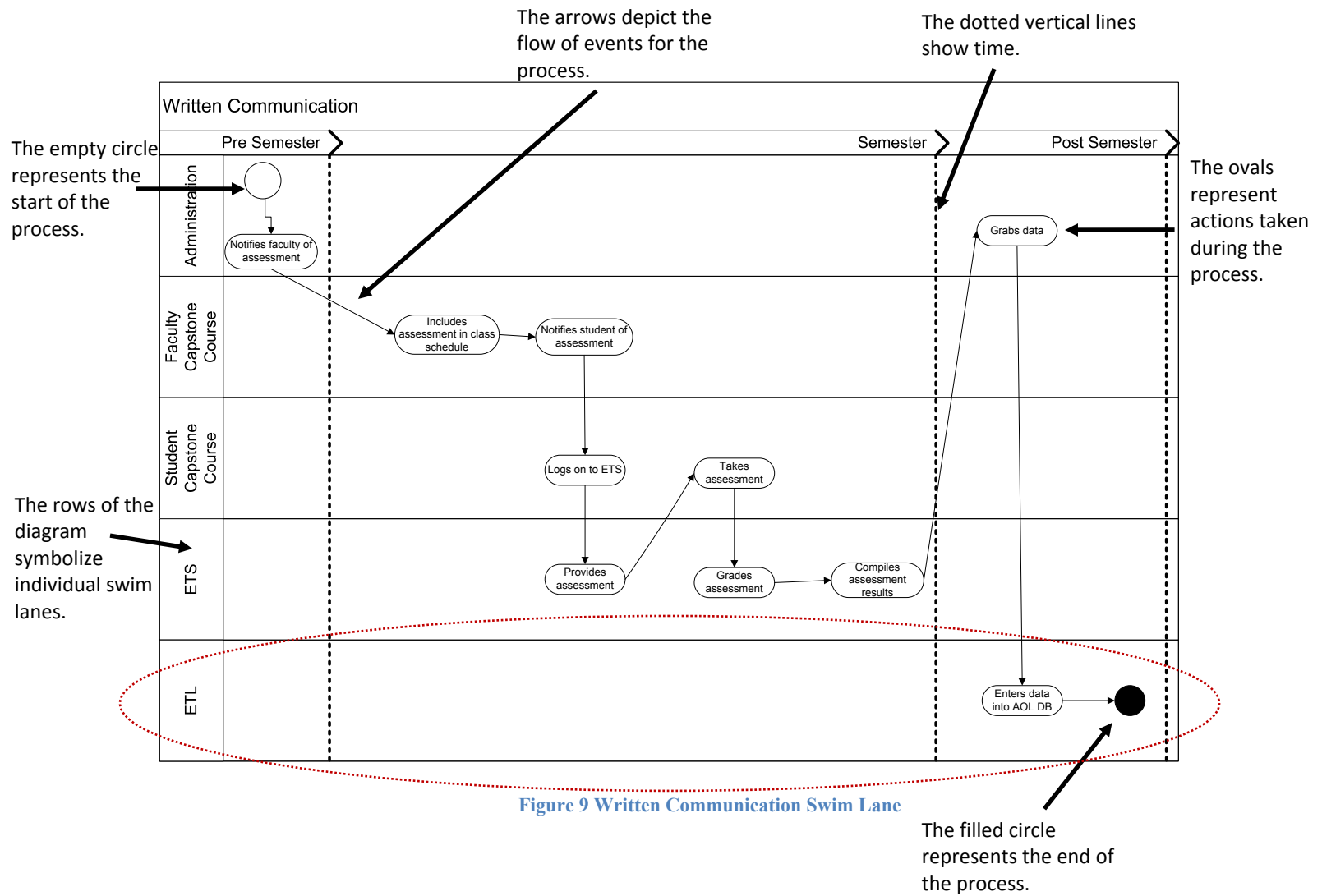
- Written Communication
- Content Knowledge
- Oral Communication
- Integration
- Team Work
- Leadership
- Problem Solving
- Critical Thinking

Each of the swim lanes generated for the project were approved first by the Capstone Committee, then by the AOL Administration.

An example of the swim lanes is the written communication learning goal demonstrated in Figure 9. For the complete collection of swim lanes refer to Appendix G.

The written communication’s process start is symbolized by an empty circle. This circle is found in the administration swim lane. The process for the written communication assessment begins prior to the start of the semester with the administration notifying the faculty of the assessment (symbolized by an

oval). At this point, the administration no longer performs any actions for the assessment, so the flow moves into the faculty's swim lane. The faculty takes action by incorporating the assessment into their syllabuses. Mid-way through the semester the faculty notifies the students it is time to take the assessment. Here, the faculty's involvement ends and the flow moves into the student's swim lane. For the written communication assessment UNCW uses a 3rd party ETS (external testing system) to administer and grade assessments. The assessment is given online, so students must login to the ETS. Once the students log on, the flow moves to the ETS' swim lane, and the ETS provides the students with the assessment. The flow moves from the ETS' swim lane into the students' swim lane and the students take the assessment. Upon completion of the assessment, the flow moves back the ETS' swim lane and ETS grades the assessments and subsequently compiles the results. The ETS' involvement terminates at this point and the flow moves into the administration's swim lane. The administration exports the compiled results from the ETS into an Excel file. Once the data is exported, the ETL (extract transform load) can enter the data into the AOL database. The written communication assessment process is now concluded which is symbolized by a filled circle located in the ETL's swim lane.



4.7 Prototype Reports

Prototypes are mock up presentations of what the end result of something is based upon. For this project prototype charts were created to help the client decide on the desired format of the charts for the AOL program.

Each chart contained the average for a learning goal for 5 semesters. The semesters were listed across the bottom on the X axis. The Y axis contained a scale for the average score achieved in the learning goal assessment. In the center of the graph there were three lines: the upper control limit (UCL), the lower control limit (LCL), and the control limit (CL). The UCLs and LCLs will be approximately 2 standard deviations from the CL. These limits were calculated on a rolling basis. The past 4 semesters of data will determine the control limits for the current charts.

There were two variations of each chart available: a template that scales everything from 0 – 100 and a template that adjusts the scale to align the control limit in the center of the chart. This approach was chosen so that charts may be presented in a uniform, comparable manner and so that trends will also be identified more easily. The 100 scale charts make it difficult to identify exact variations in student learning trends (refer to Figure 10). By adjusting the scale to a smaller range (refer to Figure 11) one can see the precise amount of variations.

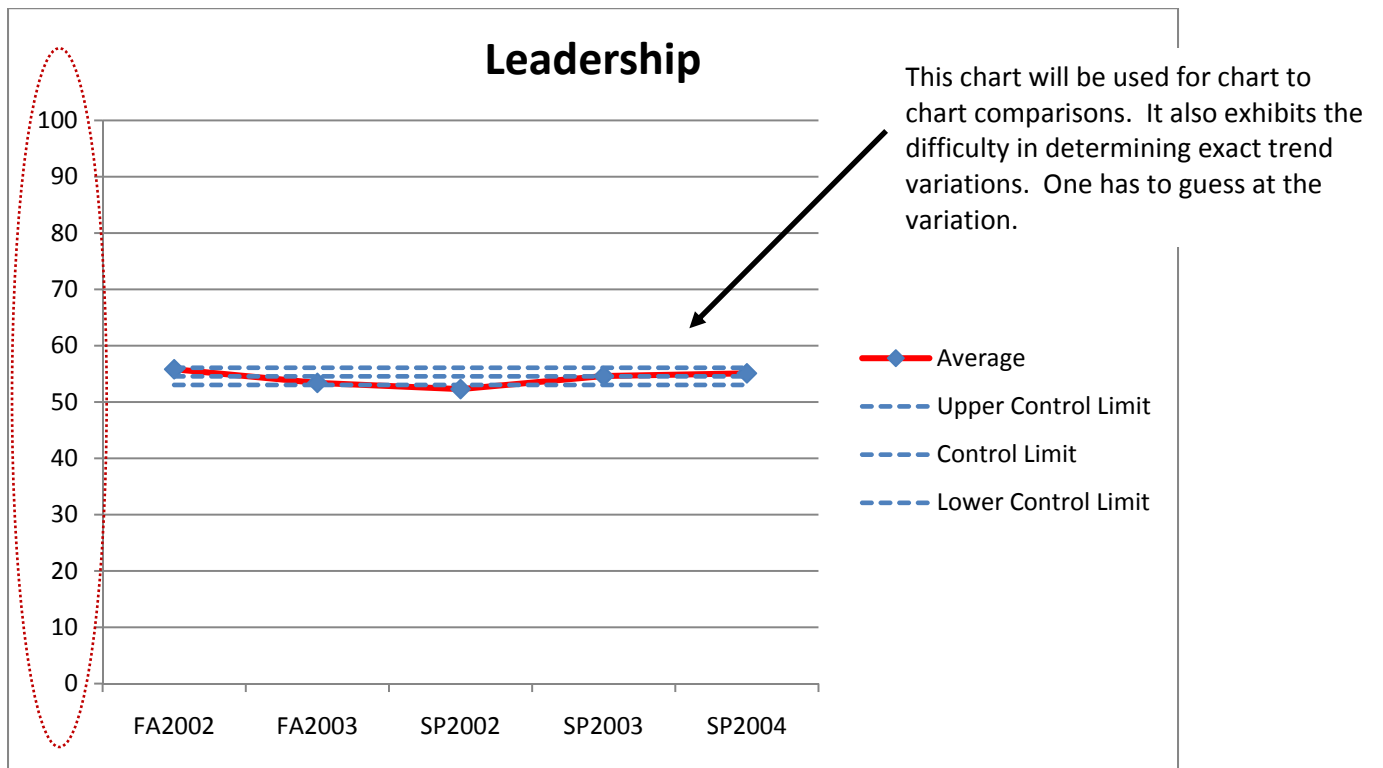


Figure 10 Mock up chart on a set scale of 0 - 100

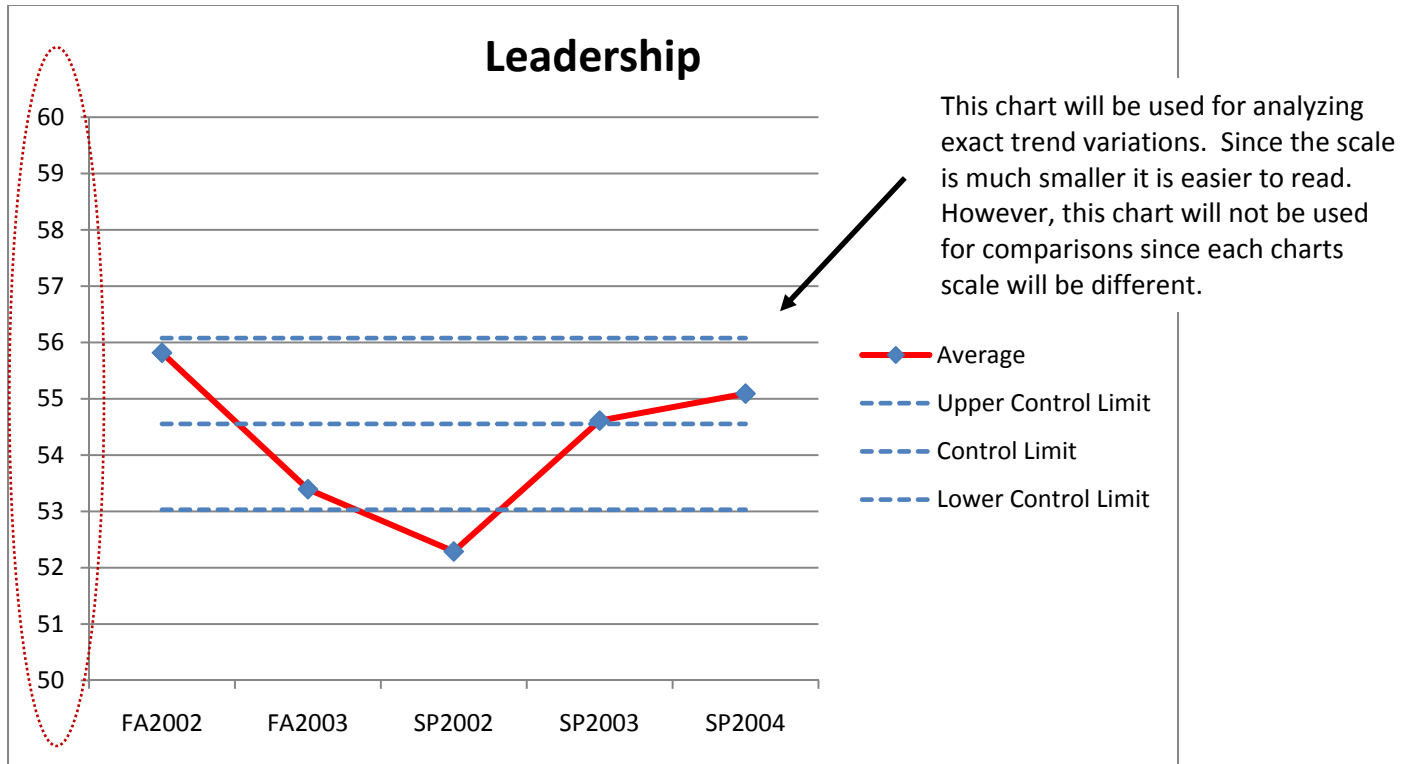


Figure 11 Mock up chart scaled adjusted

4.8 Success Criteria

Success criteria are metrics that will be used to determine whether the project is a success. The project was assessed with the success criteria post completion. The success criteria for the project were overall time saved for the stakeholders and stakeholder satisfaction.

It was estimated that the project would reduce the time spent entering data and generating charts by 50%. Prior to the project, Terrey Hatcher (AOL Administrator) spent hours preparing data in order to create the annual reports for AACSB. Refer to the chart below.

<u>Task</u>	<u>Task Details</u>	<u>Time Spent on Task</u>
Preparing for an assessment	<ul style="list-style-type: none"> • Gathering lists of students to take the assessment • Providing documentation to professors and/or students • Setting up assessment tools • Remind professors and/or students of assessment 	<ul style="list-style-type: none"> • 3-5 hours
Organizing data	<ul style="list-style-type: none"> • Gathering assessment results • Printing out data • Setting up Excel file for the data 	<ul style="list-style-type: none"> • 1-3 hours
Data entry	<ul style="list-style-type: none"> • Entering data 	<ul style="list-style-type: none"> • 1-3 hours per assessment
Consolidating data and generating reports	<ul style="list-style-type: none"> • Generating charts in Excel 	<ul style="list-style-type: none"> • 2-5 hours

Using the time estimations from the chart, one assessment would take a minimum of 7 hours from an administrator's point of view to organize the data, enter the data into the database, and generating reports. Considering there are 8 assessments, the AOL administration spends about 56 hours per semester on the AOL program. The project immensely reduces this time because it provides documentation and implements the use of SQL Server Reporting Services. The documentation provides standard formatting for the outcome results of assessments. AOL Administration no longer has to sift through various formats of data and re-format it to their specifications. Third party sites' data will be manipulated to the correct format and entered into the database by the Extract Transform Load. SQL Server Reporting Services has

templates for generating specific charts. The templates are stored procedures (queries) that grab the necessary data and create the chart. Each chart generated from these templates should take no more than a few moments at worst case. The time spent on creating ad hoc charts, charts not generated by the templates, depends on the user. SQL Server Reporting Services uses a wizard to guide users through creating the charts they want. Typically, a user familiar with the software will generate charts quicker than a user unfamiliar with the software.

Stakeholder satisfaction was measured with a survey. There were different surveys for each of the stakeholders. The surveys requested stakeholders to rate their satisfaction on different aspects of the project on a scale of 1 – 10, 1 being dissatisfied and 10 being the highest amount of satisfaction. The surveys also had a place for comments with questions. The comment sections allowed the stakeholders to fully express their satisfaction or dissatisfaction with the project. The comments will be taken into consideration for future projects. Refer to Appendix J for a list of the survey questions.

4.9 Valuation of the Project

4.9.1 Costs

The costs of the project consisted of man hours. The software being used for the project was a sunk cost since the university already owned the software and licenses for the software. Man hours were counted for project manager (Sarah Peck), the Capstone Committee (Dr. Bryan Reinicke, Dr. Douglas Kline, Dr. Devon Simmonds, and Dr. Drew Rosen), the AOL staff (Terrey Hatcher), and the AOL director (Dr. Rebecca Porterfield).

For full details about the specified man hours refer to section 6.4 Justification.

<u>Resource Type</u>	<u>Resource</u>	<u>Hours</u>
Internal	Sarah Peck	• 135 (15 weeks * 9 hours)
	Dr. Bryan Reinicke	• 45 (15 weeks * 3 hours)
	Dr. Douglas Kline	• 45 (15 weeks * 3 hours)
	Dr. Devon Simmonds	• 15 (15 weeks * 1 hour)
	Dr. Drew Rosen	• 15 (15weeks * 1 hour)
External	Terrey Hatcher	• 30 (15 weeks * 2 hours)
	Dr. Rebecca Porterfield	• 15 (15 weeks * 1 hour)

4.9.2 Benefits

The benefit of the project is better decision making. Better decision making results from the AOL Committee receiving consistent and accurate data in an efficient manner in order for them to create quality reports. The data will be in a consistent format since the faculty and administration will be following the standards set forth in the documentation. By gathering and reporting the data in a consistent manner the data is ensured to be accurate. The AOL Committee uses the accurate data to produce top quality charts and reports. From the quality charts and reports, the AOL Committee will be able to make better decisions in regard to recommendations for improving student learning.

5 Predictions

Predictions are assumptions made prior to any action taken whether it is for a scientific study, investigation, project, etc. I have developed 3 predictions regarding building the data warehouse. These predictions are discussed in detail below. They were revisited and discussed after implementation of the project.

5.1 Stakeholder Management

Managing the stakeholders may be difficult because of differences of opinions between the client and end users. At the beginning of the project the end users had an abstract idea of what they wanted/needed while the client had a precise idea of what was needed and may be desired from the system. Through a few iterations of mock up charts and diagrams the wants/needs for the end users were established and aligned with the client's. However, the end users and the client also differ on how the charts should look and how the data for the charts should be calculated. This may make it difficult to completely satisfy the end users and the client with the end reporting features of the system.

5.2 Reporting Services

Reporting Services may be a hindrance in the project because I am unsure if it can handle building graphical representations of the data. If Reporting Services cannot handle chart generation I will have to create macros in Excel in order to create the charts. Using macros will increase the manual efforts and subtract from the success criteria of automating the process.

5.3 Control Limits

Coding the control limits may prove to be difficult because I am unfamiliar with Reporting Services and do not know if it has a feature available to add control limits. If Reporting Services cannot automatically insert control limits into the graphs I will use the Visual Basic language to code the insertion of control limits. Generating code for the control limits will constrict the time line of the project.

6 Project Plan

6.1 Scope

The scope of the project consisted of building a data warehouse and fully documenting UNCW CSB's AOL system. The chart below describes in detail the activities I performed in order to complete the project.

<u>Hours</u>	<u>Activity</u>	<u>Activity Details</u>
5	Create stored procedures for reports and charts	<ul style="list-style-type: none">• Defining a standard way to calculate the control limits (2 hours)• Coding control limits (20 hours)• Testing stored procedures (3 hours)
20	Create charts and reports	<ul style="list-style-type: none">• Creating reports and charts• Revisions
10	Create data entry pages in database	<ul style="list-style-type: none">• Problem Solving (5 hours)• Critical Thinking (5 hours)
10	Create stored procedures for inserting data from the data entry pages	<ul style="list-style-type: none">• Problem Solving (2 hours)• Critical Thinking (2 hours)• Written Communication (2 hours)• Content Knowledge (2 hours)• Test the stored procedures (2 hours)
5	Create Excel file with macros for the ETL	<ul style="list-style-type: none">• Research how to create macros (1 hour)• Code the macros (3 hours)• Test the macros (1 hour)
0	Create folder for Excel files	
30	Create Extract Transform Load (ETL)	<ul style="list-style-type: none">• Research how to do build an ETL (10

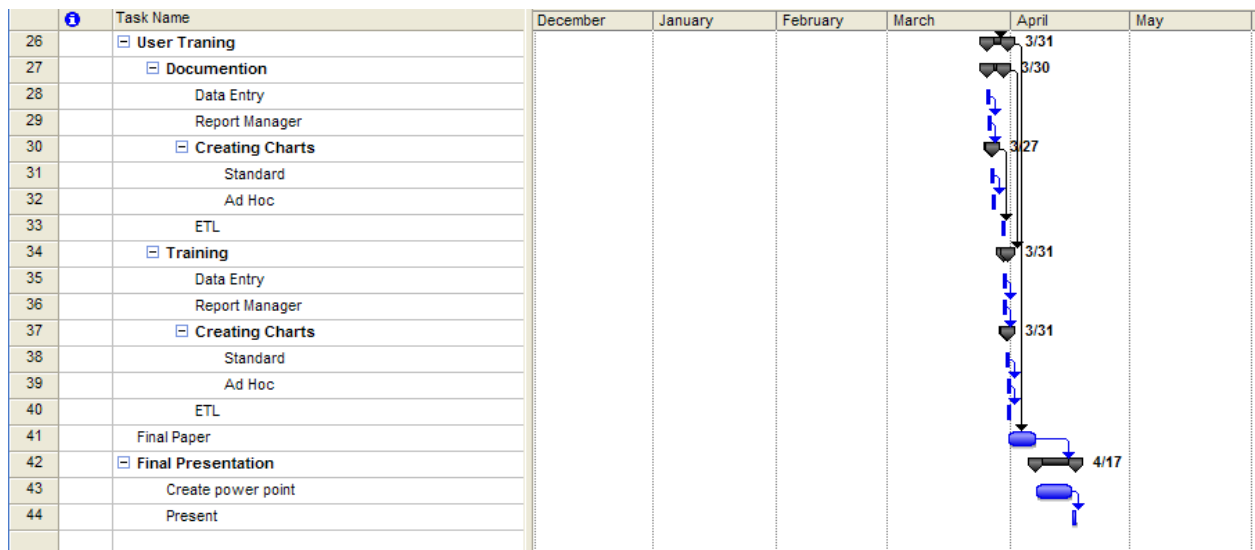
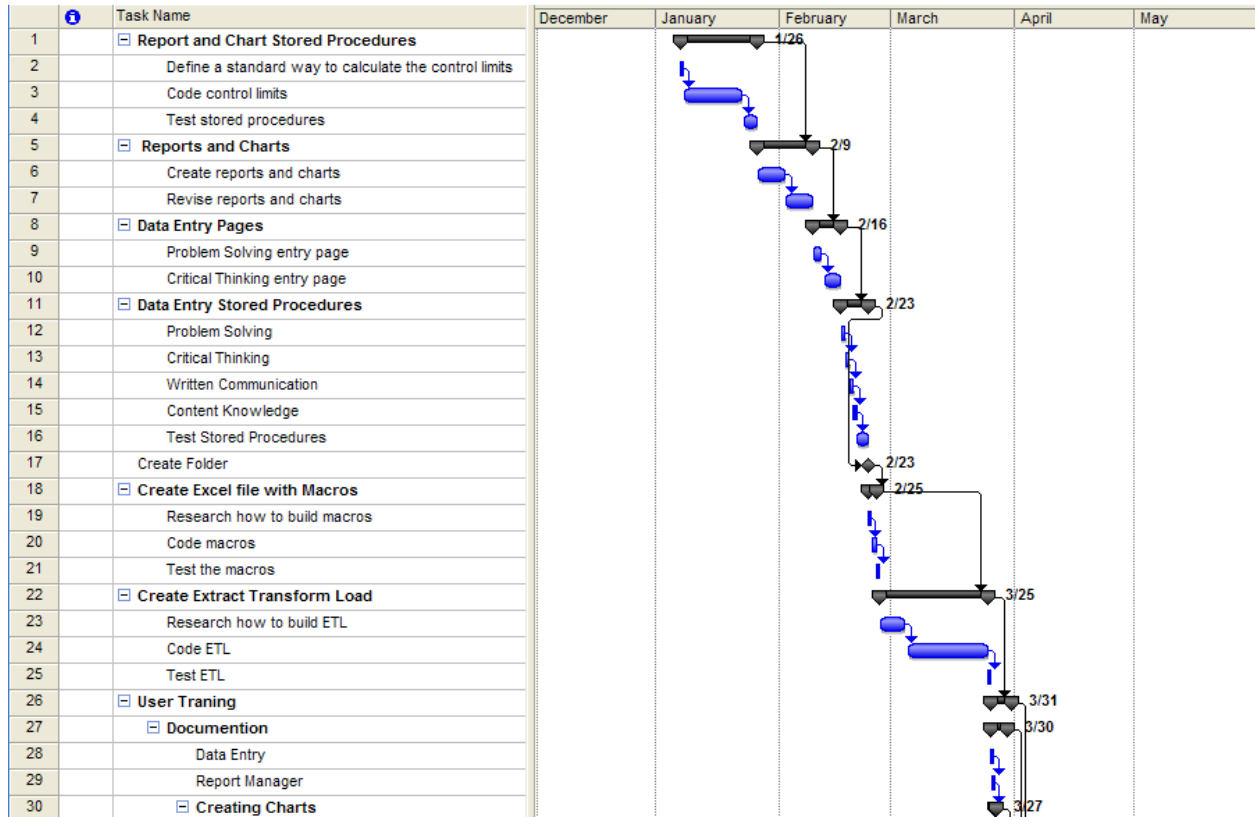
		<ul style="list-style-type: none"> hours) • Code the ETL (19 hours) • Test the ETL (1 hour)
7	User Training	<ul style="list-style-type: none"> • Create documentation for: (5 hours) <ul style="list-style-type: none"> ○ Data Entry (1 hour) ○ Navigating to Report Manager (1 hour) ○ Creating charts (2 hours) <ul style="list-style-type: none"> ▪ Standard ▪ Ad Hoc ○ Using the ETL (1 hour) • Walk users through (2 hours) <ul style="list-style-type: none"> ○ Data Entry (1/2 hour) ○ Navigating to Report Manager (1/2 hour) ○ Creating charts (1/2 hour) <ul style="list-style-type: none"> ▪ Standard ▪ Ad Hoc ○ Using the ETL (1/2 hour)
20	Write final paper	<ul style="list-style-type: none"> • Create final paper
10	Create final presentation	<ul style="list-style-type: none"> • Create power point presentation
1	Final presentation	<ul style="list-style-type: none"> • Present

6.2 Timeline

The time frame for this project is broken in to 2 segments: the proposal, and the creation and implementation of the system. The proposal began on August 20, 2008 and ended on December 3, 2008.

The creation and implementation portion began on January 7, 2009 and completed on May 13, 2009.

Below is a Gantt chart illustrating the project timeline for the creation and implementation portion of the project in greater detail.



6.3 Resources

Resources are “people, equipment, facilities, funding, or anything else ... required for the completion of a project.” (Wikipedia, Resource (Project Management)) The resources for this project largely comprised of people. This made the project timeline sensitive to everyone’s schedule. It was very important for every resource to allocate enough time to the project in order to have completed on time. Below is a list of the project’s resources and their respective responsibilities.

<u>Resource</u>	<u>Responsibility</u>
Dr. Rebecca Porterfield	Provide information/business requirements
Terrey Hatcher	Provide information/business requirements
Dr. Doug Kline	Client/business/functional requirements/ Capstone Committee
Sarah Peck	Design/implement the project
Dr. Bryan Reinicke	Capstone Committee chair
Dr. Devon Simmonds	Software engineering consultation/ Capstone Committee
Dr. Drew Rosen	Project management consultation/ Capstone Committee
Microsoft Access	Database software for AOL database
SQL Server	Backend of database
SQL Server Reporting Services	Report generation tool

6.4 Justification

In section 4.9.1 Costs, I included estimated times needed from each resource. The chart below describes the tasks that each resource will spent their allocated time on.

<u>Resource Type</u>	<u>Resource</u>	<u>Tasks</u>
Internal	Sarah Peck	Refer to section 6.1 Scope above
	Dr. Bryan Reinicke	<ul style="list-style-type: none"> • Review/proof read final documentation • Review/Approve final chart configurations • Review/Approve user training documentation • Review/Approve data entry pages • Review power point presentation
	Dr. Douglas Kline	<ul style="list-style-type: none"> • Review/proof read final documentation

		<ul style="list-style-type: none"> • Review/Approve final chart configurations • Review/Approve user training documentation • Review/Approve data entry pages • Review power point presentation • Review/Approve stored procedures • Review/Approve ETL
	Dr. Devon Simmonds	<ul style="list-style-type: none"> • Review/proof read final documentation • Review/Approve final chart configurations • Review/Approve user training documentation
	Dr. Drew Rosen	<ul style="list-style-type: none"> • Review/proof read final documentation • Review/Approve final chart configurations • Review/Approve user training documentation
External	Terrey Hatcher	<ul style="list-style-type: none"> • Approve chart configurations • Approve data entry pages • Approve ETL • User Training
	Dr. Rebecca Porterfield	<ul style="list-style-type: none"> • Approve chart configurations • Approve data entry pages • Approve ETL • User Training

Part II:

PROJECT EXECUTION

7 Project Execution

7.1 AOL Sequence/System Diagram for the ETL and Reporting

Below are the AOL sequence/system diagrams for the ETL and reporting. The diagrams are a compilation of a sequence and system diagrams. A sequence diagram represents the interaction between processes and in what order the processes occur. A system diagram represents external entities that may interact with a system. The AOL sequence/system diagram shows both interactions: external entities such as the user, a web browser, and the UNCWCSBAPP server; and the sequence of processes needed to execute the ETL and view or create reports. The processes are separated into 2 main activities: entering data from the ETS export and for viewing/creating reports. The processes are shown in two separate figures, 12 and 13.

In Figure 12, the data entry activity, the user will use a web browser to log into the ETS Upload Website that resides on the UNCWSARAHP web server. The user will upload the ETS CSV file and initiate the process to execute the ETL from the website. Once the user specifies that he/she would like to run the ETL the web server executes an operating system batch file. The batch file, ETSbatch.bat, executes the dtexec dos command. The dtexec dos command starts the ETL package, ETSImport.dtsx. The package locates the uploaded CSV file, appends it to the dbo.ETSData table and the dbo.ETSTemp table in the AOL database. After the data is imported, the ETL executes a stored procedure that modifies the data to match the input criteria of the Response and Respondent tables and inserts the data into the tables.

Figure 13, the reports activity, begins with a user using a web browser to log into reporting services report manager. After logging in, the user will specify parameter values for the reports such as year, learning goal, and outcome. Reporting services uses the parameter values to query data from the AOL database. Once the query results are received, reporting services creates the reports and displays it to the user.

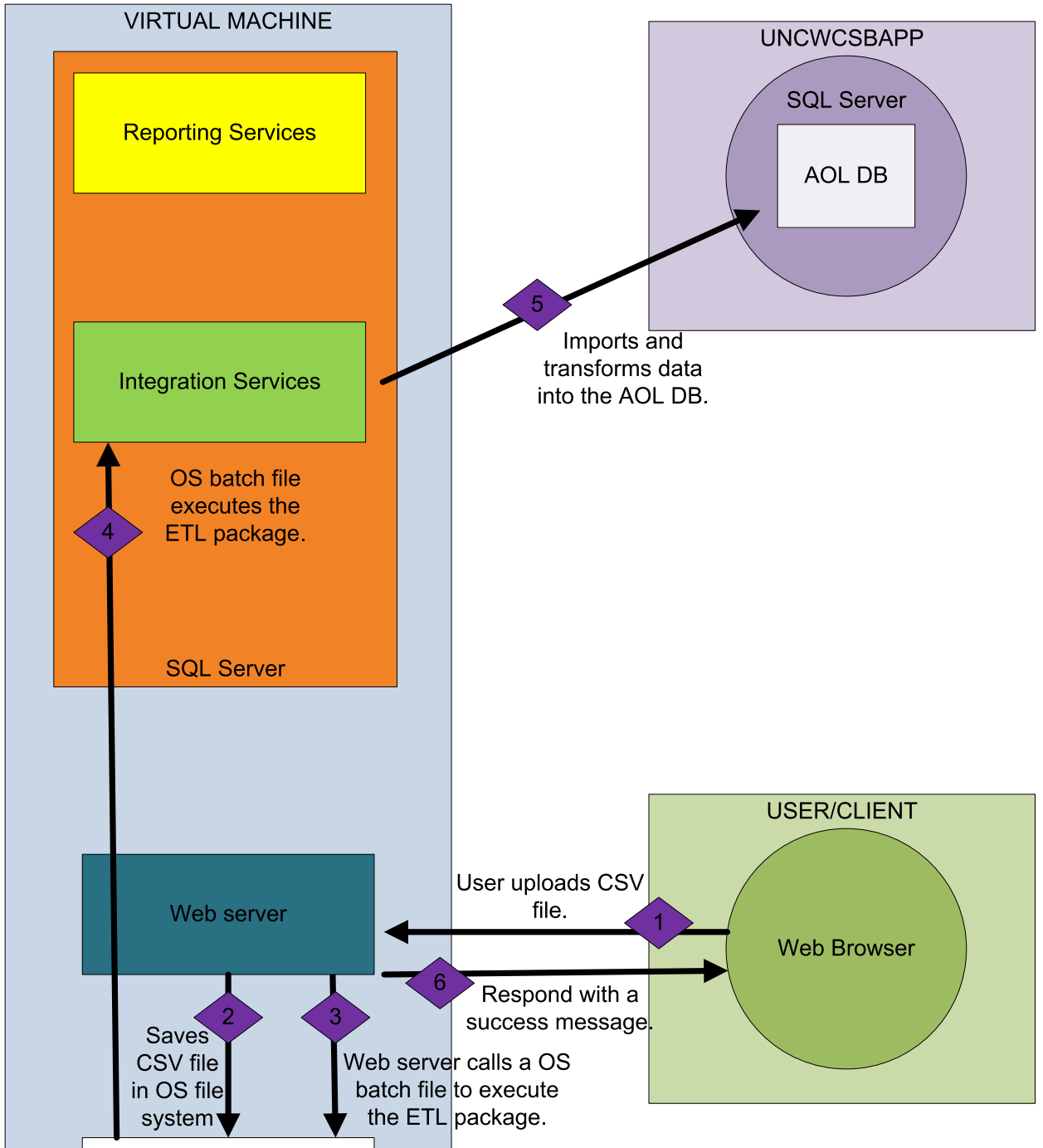


Figure 12 AOL System/Sequence Diagram for the ETL

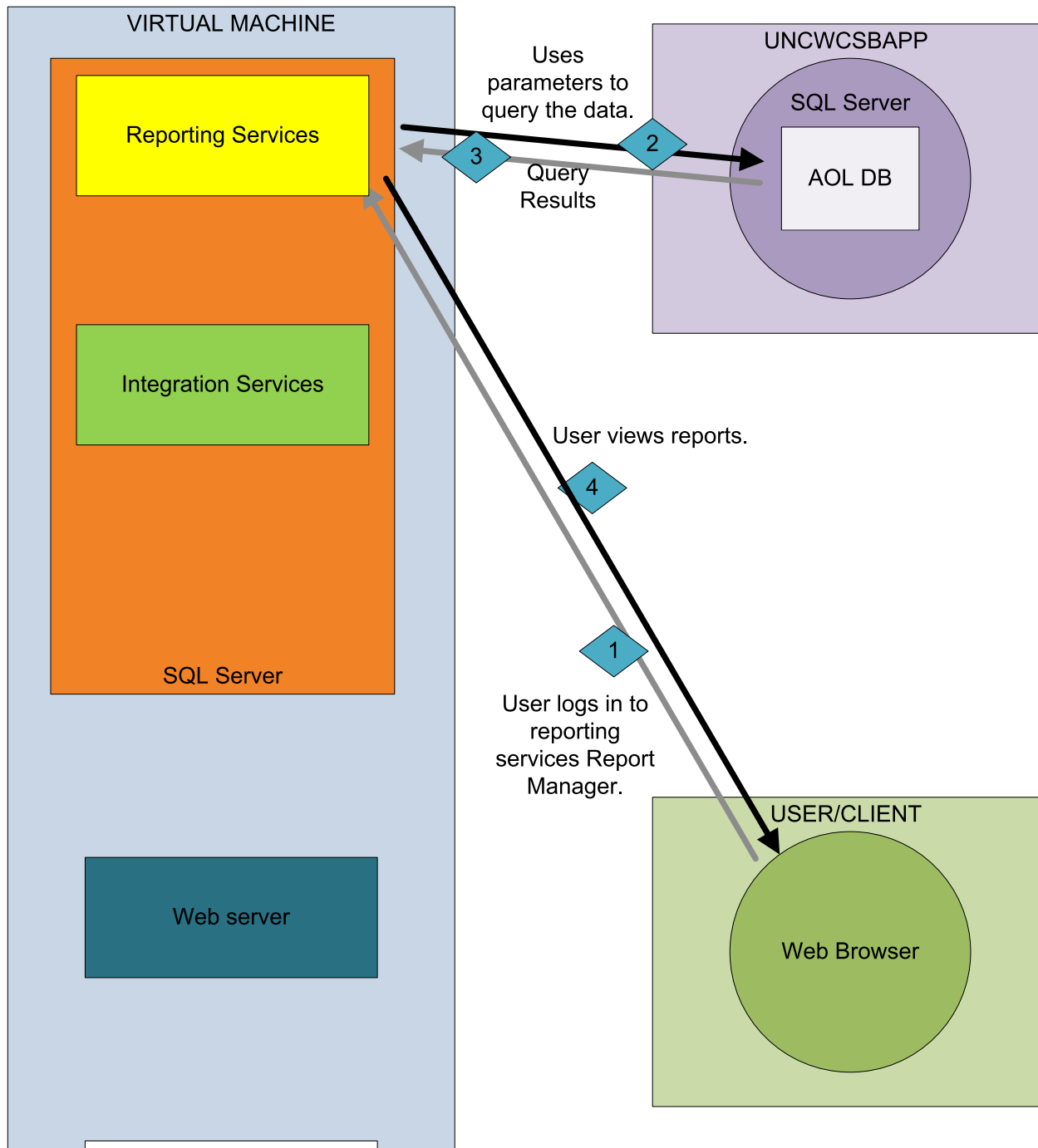
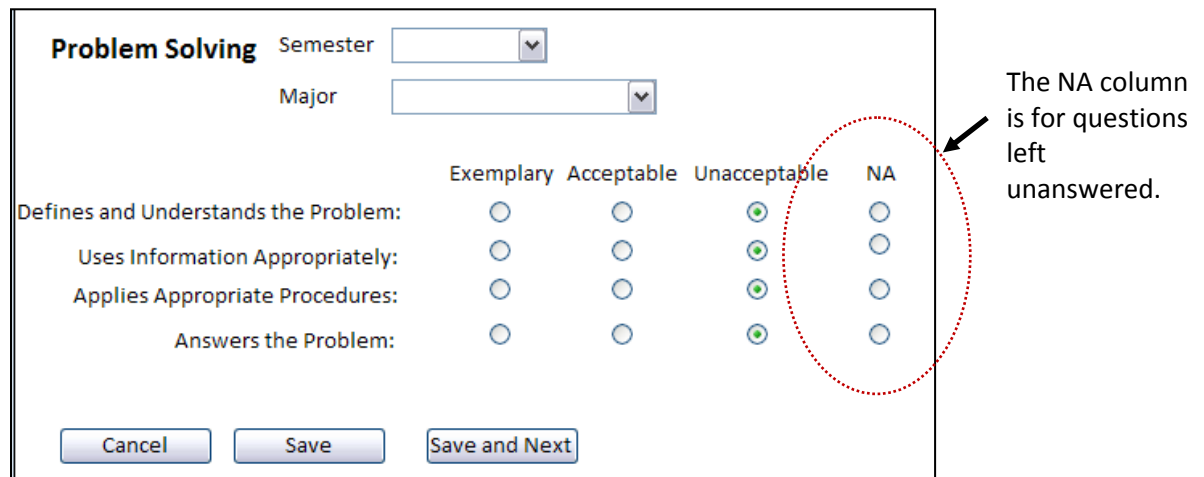


Figure 13 AOL System/Sequence Diagram for Reporting

7.1.1 Data Entry Forms

7.1.1.1 NA Option

All data entry forms were updated with an “NA” column. The purpose of this column is to retain as much data as possible. Prior to the inclusion of the column, if a student had not answered a question within a set the entire data set was omitted. There was not a way to only dispose of that particular question. The NA column provides users with an option to mark a question as unanswered. When the NA option is selected a value of -1 is returned for that question (all other choices return positive integers). Once the “Save” or “Save and Next” button is selected only questions with positive values are recorded in the database; thus, every question with an answer is stored and only a minimum amount of data is lost.



The screenshot shows a data entry form titled "Problem Solving". At the top, there are two dropdown menus for "Semester" and "Major". Below these is a table with four columns: "Exemplary", "Acceptable", "Unacceptable", and "NA". Each row represents a different skill or step in the problem-solving process. The "Unacceptable" column has green checkmarks in the first three rows, while the "NA" column has empty radio buttons in all four rows. A red dotted circle highlights the "NA" column, and an arrow points to it from the text "The NA column is for questions left unanswered." At the bottom of the form are three buttons: "Cancel", "Save", and "Save and Next".

	Exemplary	Acceptable	Unacceptable	NA
Defines and Understands the Problem:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Uses Information Appropriately:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Applies Appropriate Procedures:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Answers the Problem:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Figure 13 NA Option on Data Entry Forms

7.1.1.2 Problem Solving and Critical Thinking Forms

Data entry forms for the Problem Solving and Critical Thinking learning goals were missing from the original set of data entry forms (refer to section 6.1 Scope). The two data entry forms were created based on the standard format of the original data entry forms. Each form allows a user to select the corresponding semester and major for each respondent from a drop-down list. The drop-down lists are populated by querying the Semester and the Major tables in the AOL database. After the semester and

major values are selected they are stored in parameters. Next the user would select the appropriate radio button for each answer based on a student's response. Each radio button is designated a value (4 for the Exemplary option, 2 for the Acceptable option, 0 for the Unacceptable option, and -1 for the NA option). When a radio button is selected the value is stored in a parameter associated with the question. The values represent the score a student would receive for their answer. Only values that are positive are passed to the AOL database. Refer to section 7.1.1.1 NA Option for more details. Upon clicking the "Save" or "Save and Next" buttons, a stored procedure uses the parameters to insert the major and semester into the Respondent table. The Respondent table generates a respondent ID for each of the students. The stored procedure records the respondent ID in a parameter and inserts the respondent ID, value of each question, and the outcome ID associated with the question into the Response table. Figure 15 shows the data entry form for the Critical Thinking learning goal.

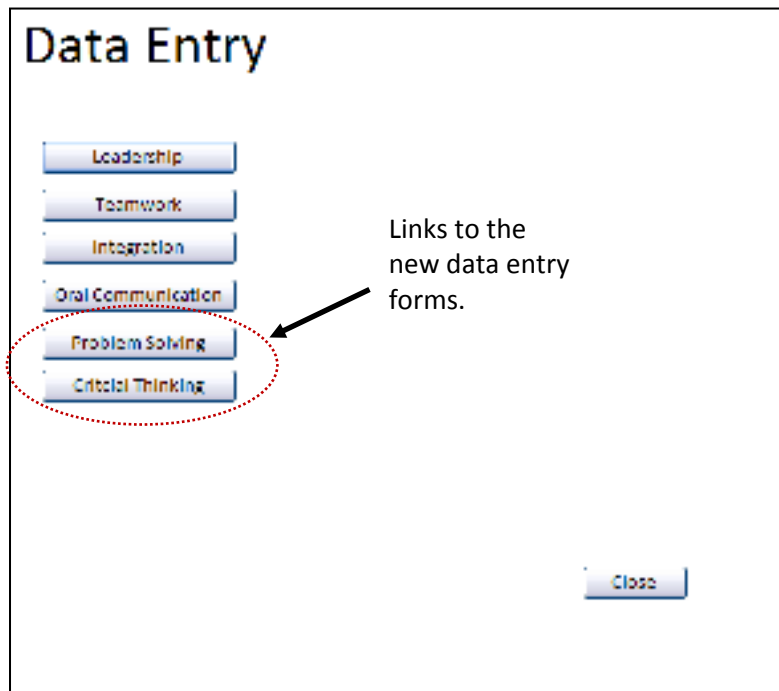


Figure 14 Data Entry Home Page

Critical Thinking Semester
Major

	Exemplary	Acceptable	Unacceptable	NA
Defines and Understands the Issue:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Considers Multiple Perspectives:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
Evaluates the Evidence:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Figure 15 Critical Thinking Data Entry Form

7.1.2 Extract Transform Load (ETL)

The AOL administration spent an average of 2 hours preparing data to be entered into the AOL database (refer to section 4.8 Success Criteria). An ETL was built to automate the transformation of the data exported from ETS for the Written Communication goal. SQL Server Integration Services was used to construct the ETL. The ETL is comprised of 3 separate data transformation services (DTS) packages. DTS packages are the fundamental logical component of a data transformation service. Packages are used whenever data is modified with DTS (Wikipedia, Data Transformation Services). They define the connections to data sources and destinations as well as the tasks necessary to transform the data into a desired output. For this project, SQL Server Integration Services (SSIS), a platform to build data integration and workflow applications, is used as the application to modify data.

The package for the AOL ETL, ETSImport.dtsx, locates the ETS exported CSV file and imports the data first into the ETSDData table and then into the ETSTemp table. The ETSDData table's purpose is to provide an audit trail for the data as it enters the system. Raw data is appended is imported without transformation. Each record is time stamped and appended to the ETSDData table. The temporary table, ETSTemp, is used for continuation of the ETL process, and is cleared of all data after completion of the ETL. After the data is imported into the 2 tables, the package executes the stored procedure, dbo.ETSDDataTransformation, to modify the data. Refer to Appendix Q for dbo.ETSDDataTransformation.

The ETSImport package consists of 3 workflows: 2 table insertions and 1 SQL statement execution (refer to Figure 17). Each workflow contains a set of instructions to complete its task. The instructions in the workflows provide the necessary source and destination connection information for the task. The source block contains the physical address of the CSV file. Since this path is hard coded each time the ETS data is exported it will overwrite this particular file allowing for the hard coded address.

The first workflow “Insert into ETS Data Table” copies the CSV file, connects to the AOL database, and appends the data to the ETSDData table. The “Insert into ETS Data Table” workflow designates the data source as the ETS exported CSV file and the data destination as the ETSDData table in the AOL database. The destination block contains the log in information for the AOL database. The “Execute SQL Data Manipulation” task is similar to the execute SQL task in Figure 18. It connects to the AOL database and executes the stored procedure dbo.ETSDDataTransformation. Figure 18 shows the correlation of the data workflows and the tasks within the ETSImport package.

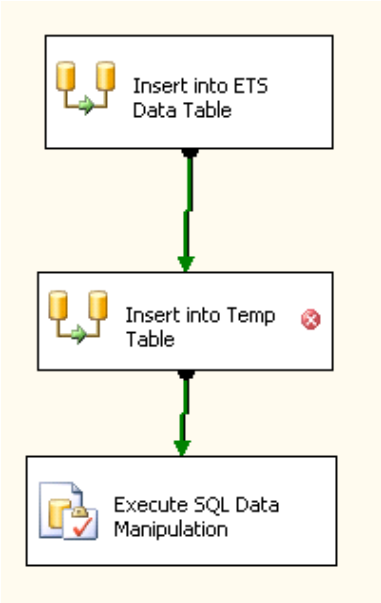
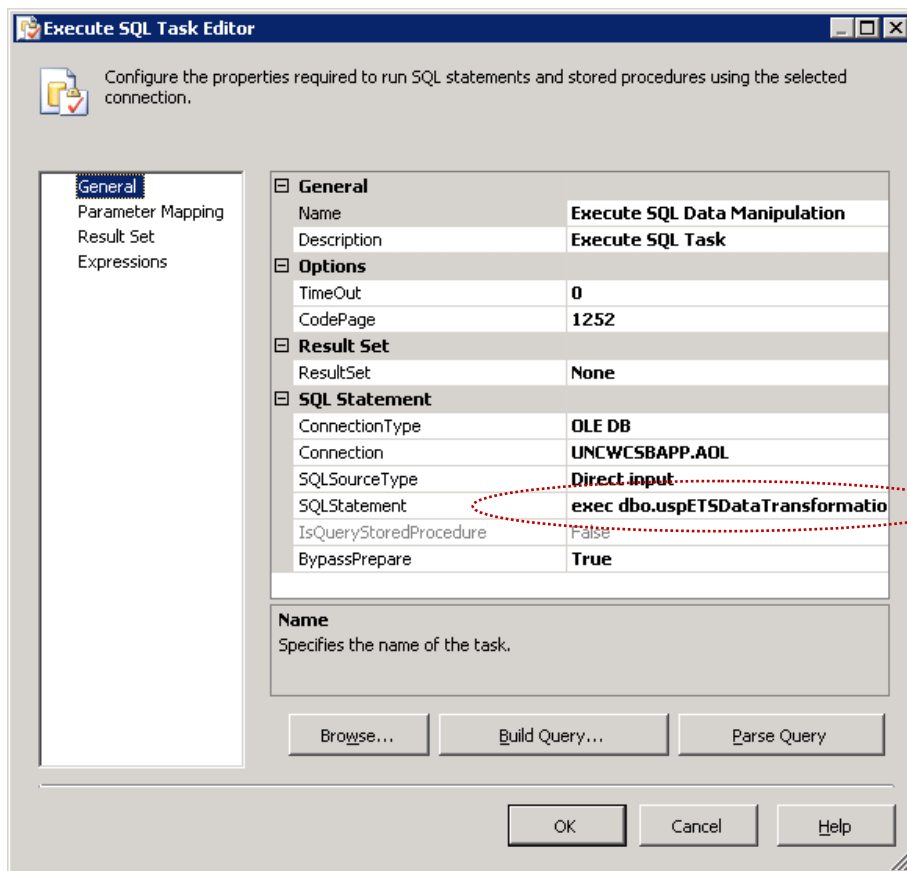
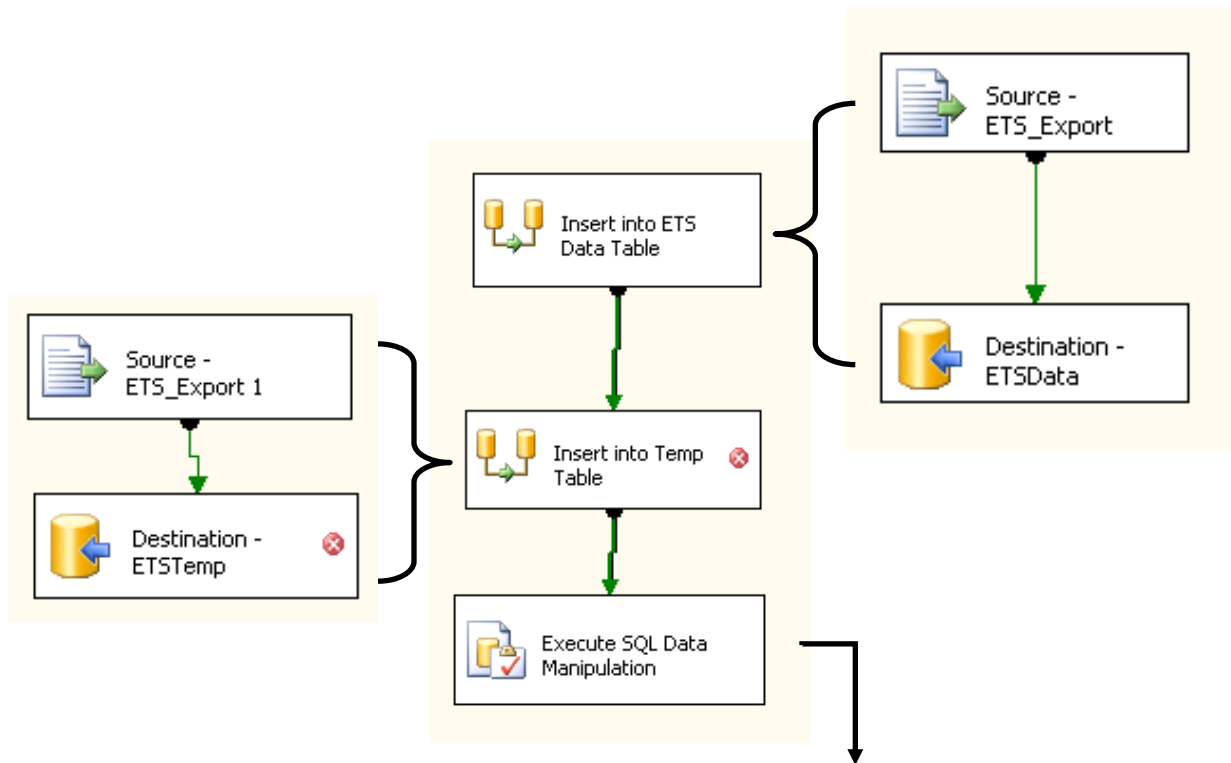


Figure 16 ETSImport Package



The stored procedure to transform the data is designated here.

Figure 17 Breakdown of ETSImport Package

7.1.3 Web Site

A web interface was created to automate the process of uploading ETS exports and executing the ETL and provides an easy to use interface for the AOL administrator. The web site consists of 4 pages: a home page, a login page, an upload page, and a page to execute the ETL package. The website is linked to the AOL database so a user can easily access the website by clicking on the “Upload ETS Data” button in the home screen of the AOL database (refer to Figure 19). The website may also be accessed by entering the URL of the website (<http://xxx.xx.xx.xxx/AOL/Home.aspx>) into a web browser. The button is a hyperlink to the ETS Upload web site on the web server (xxx.xx.xx.xxx).

The first page a user will encounter is the home page. On the home page is a link to log into the website. A user will log in to the website with credentials supplied in the User Documentation. Figure 20 shows the login screen for the website. After the user logs into the website he/she will be redirected to a page to upload a file. There is a standard browsing tool that allows the user to locate the exported CSV file from ETS and upload it to the web server. Figure 21 shows the upload screen for the website. The file is stored in a folder residing on the C drive of the server.

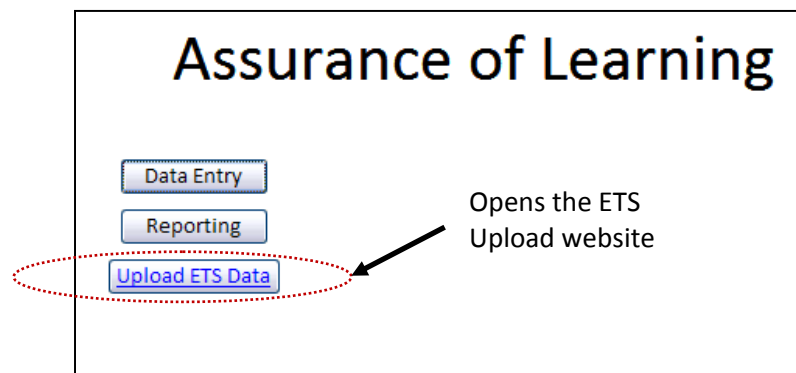
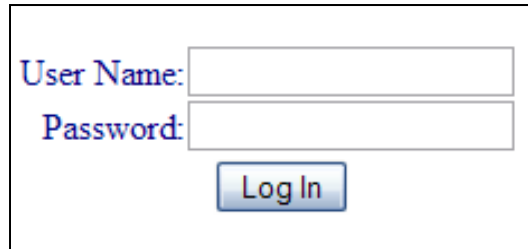


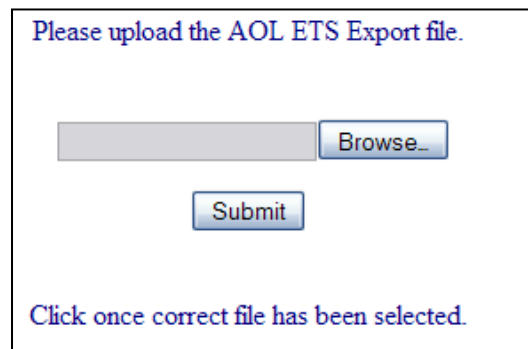
Figure 18 Upload ETS Data button on Home page of the AOL database



User Name:

Password:

Figure 19 Login Screen of ETS Upload Website

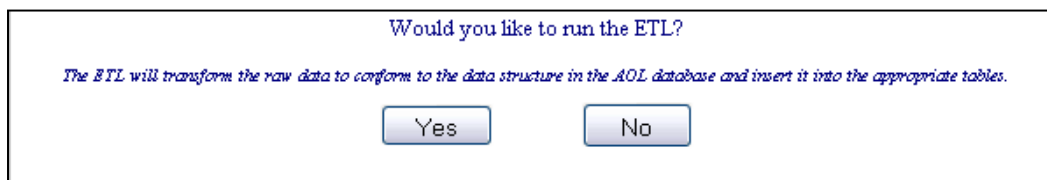


Please upload the AOL ETS Export file.

Click once correct file has been selected.

Figure 20 Upload Screen of ETS Upload Website

Once the file has been uploaded the user would be redirected to the ETL execution page. There he/she has the option to initiate the execution of the ETL package. Figure 22 shows the prompt for a user to execute the ETL batch file. The No button will redirect the user to the home page of the website. The Yes button will execute the ETL. Upon completion a message box will prompt a user whether or not he/she would like to upload another file. Figure 23 shows the ETL Confirmation page. The page prompts the user for uploading another file. If the user selects the Yes button he/she is redirected to the upload page. If the No button is selected the user will be redirected to the home page of the website. Refer to Appendix P for a full viewing all of the website pages.



Would you like to run the ETL?

The ETL will transform the raw data to conform to the data structure in the AOL database and insert it into the appropriate tables.

Figure 21 ETL Upload Page

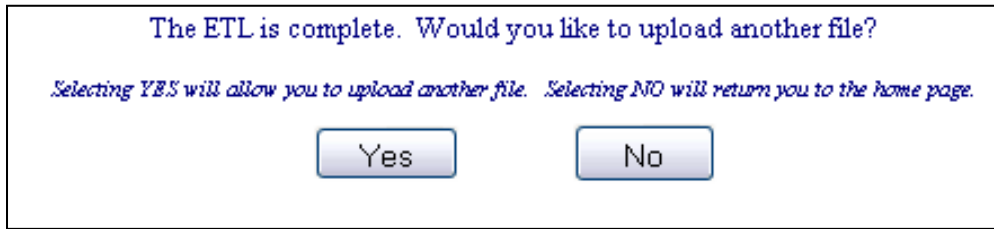


Figure 22 ETL Confirmation Page

7.1.4 Charts

Three sets of parameterized chart templates were created for AOL reporting. Each set of chart templates contained a template that allows a user to choose a specific year and learning goal and a template that allows a user to choose a specific year, learning goal, and outcome. The parameters are selected through drop-down lists in the Reporting Services Report Manager interface. The outcome drop-down list in the outcome based reports populate based on the learning goal selection. Users can only select an outcome that is associated with the specified learning goal. Figure 24 illustrates a learning goal based report parameter selection and Figure 25 illustrates an outcome based report parameter selection. The charts may be accessed through the AOL database interface or by entering the Report Manager URL (<http://xxx.xx.xx.xxx/Reports>) in a web browser. Similar to the link to the ETS Upload website, the AOL database interface contains a hyperlink on the Reporting form to the Report Manager which resides on the web server (xxx.xx.xx.xxx). This is shown in Figure 26.

The report templates were approved by Dr. Douglas Kline on April 24, 2009 and then by the AOL Administration on April 29, 2009.

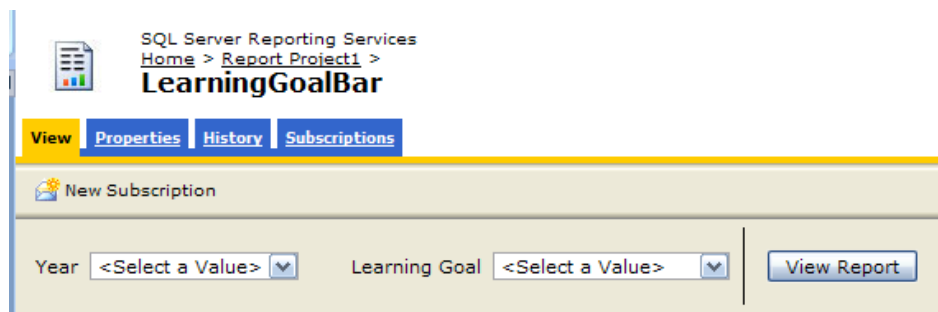


Figure 23 Parameters for Learning Goal Reports

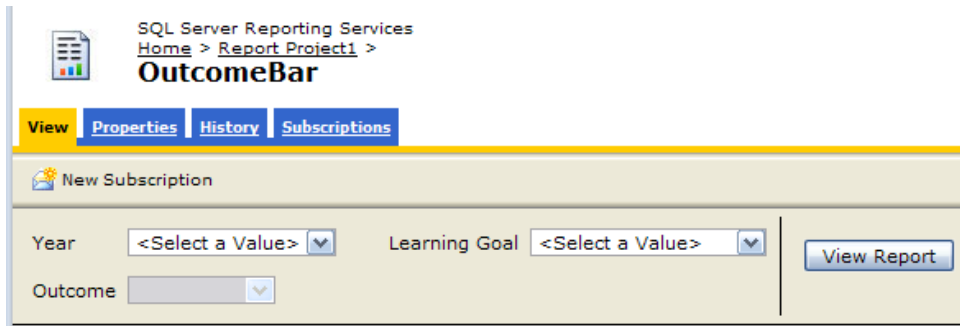


Figure 24 Parameters for Learning Goal Outcome Reports

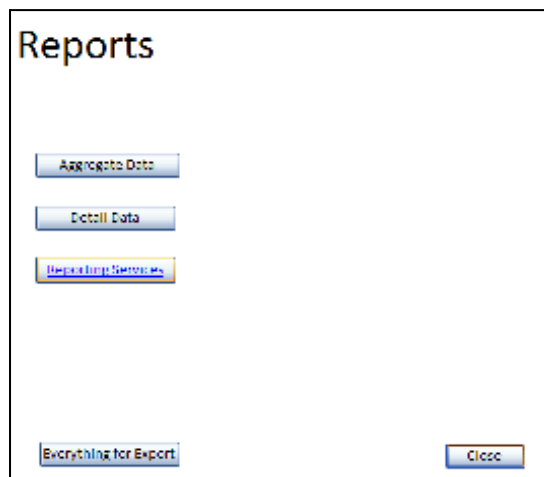


Figure 25 Hyperlink to the Report Manager

7.1.4.1 Bar Charts

Bar charts are charts which consist of rectangular bars whose lengths are proportional to the values they represent. These charts are often used to quickly visualize trends in data. The bar charts for CSB’s AOL program represent the average scores of students for each academic term. The scores can be viewed either by learning goal or by individual outcomes for a learning goal. Figure 27 is an example of a bar chart for the Leadership learning goal. The chart shows an increase in average scores for the Summer II term.

Overall Learning Goal Results

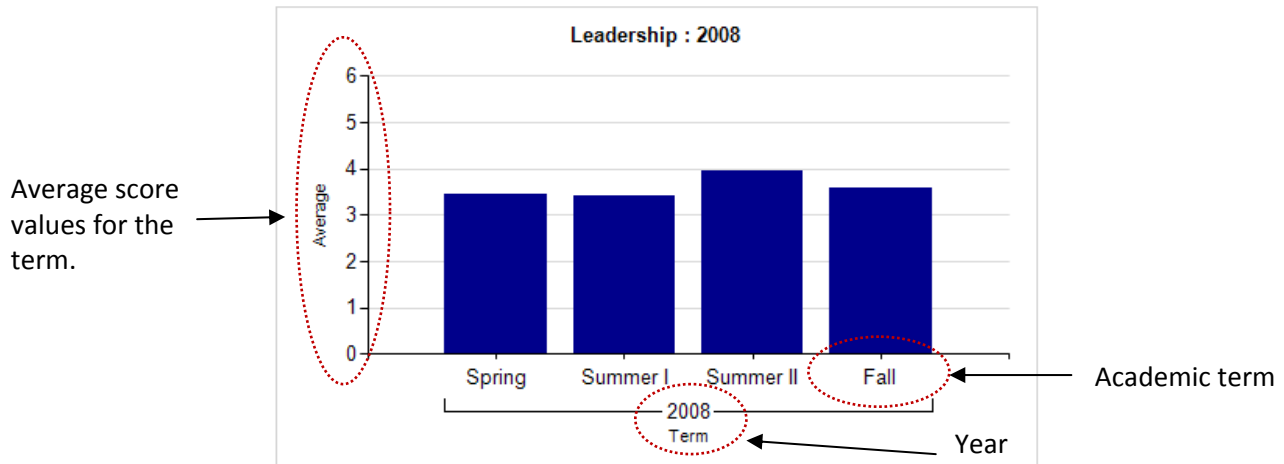


Figure 26 Example of a Learning Goal Bar Chart

7.1.4.2 Range Charts

Range charts are a set of variable – control charts in which the range of a subgroup is used to track variations within a process (BusinessDictionary.com). Range charts allow for better quality control. The range charts for CSB’s AOL program illustrate a range of 3 standard deviations from the averages. The averages are marked by the horizontal lines and the ranges are designated by the vertical lines. Figure 28 is an example of a range chart for the Leadership learning goal. By looking at the chart one could infer that the Spring, Summer I, and Fall terms have approximately the same range of average scores (between 1 and 6). The Summer II term has a much tighter range of scores (between 3 and 5). This deviation of the norm implies that something was different for that particular term. Perhaps a low enrollment caused the tighter range. If the Summer II term did have a low enrollment compared to the other 3 terms the tightening could be caused by the student – faculty ratio; students during that semester may have received more one-on-one time with their professors and hence the increase in the average and smaller range.

Overall Learning Goal Results

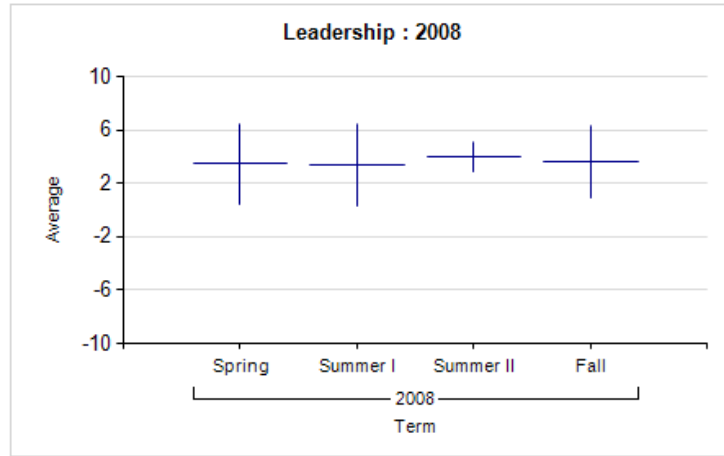


Figure 27 Example of a Learning Goal Range Chart

7.1.4.3 Tabular Charts

Tabular charts are the counterparts of bar charts. They illustrate data in a numeric format. The values in tabular charts are not graphically represented; instead they are represented in a table format. This format allows users to see precisely what the values are. Figure 29 illustrates a tabular chart for the Leadership learning goal.

Overall Learning Goal Results

Leadership : 2008

YEAR	TERM	AVERAGE
2008	Fall	3.59
	Spring	3.44
	Summer I	3.41
	Summer II	3.96

Figure 28 Example of a Learning Goal Tabular Chart

7.2 Planned Implementation versus Actual Implementation

This section of the paper will discuss the actual events versus what was originally planned during the proposal phase of the project. As is the case with any project, several components of this project changed from the initial planning. The main components that deviated from this project's proposal were the project timeline and the client meetings. Because of the deviations, and the delays caused by them, the project was delivered for user testing on May 6th – 58 days later than the original anticipated date of March 2nd 2009.

7.2.1 Timeline

The project timeline was affected by several factors: unanticipated sick leave, and learning the process of conducting accurate research.

7.2.1.1 *Unanticipated Loss of Time*

When the project timeline was initially created, it reserved approximately 30 hours as a buffer. A 6 week hiatus for being sick was not incorporated into the schedule. During the 6 week period minimal work was done. This inactivity caused the loss of the 30 buffer as well as putting the project behind schedule.

7.2.1.2 *Conducting Research*

In the beginning of the project research was blindly conducted in unfamiliar areas. It was not apparent what exactly was needed to accomplish building an ETL. Often the research results were misleading and time would be lost investigating unnecessary means to accomplish building an ETL. For instance, 30 hours were spent on researching, understanding, and building Excel macros in VBA to perform the data transformation SSIS does automatically. However, over time conducting accurate research became easier and more efficient. And less time was spent on round about ways and more time was spent building a quality product.

7.2.2 Meetings

Communication is crucial for projects to complete successfully. Communication for this project entailed face to face meetings, emails, and phone calls with users, stakeholders and experts. Initially weekly face to face meetings were planned with the project committee and the clients, with the other forms of communication occurring when necessary. However, as the project progressed the frequency and scheduling of meetings did not remain consistent. During the proposal phase weekly meetings were held on Wednesdays at 11:00am for one hour. Meetings with the clients were not held on a regular basis but occurred frequently. During the latter half of the project, the execution phase, committee meetings were not scheduled on a weekly basis. The meetings occurred whenever they were a necessity. The client meetings happened less frequently than before, but increased towards the end of the project when prototypes became available.

Despite the divergence from the original schedule, every meeting was effective and beneficial. It was a rare incident to stray off topic during a meeting and not quickly return to what was at hand. Of all the meetings, the prototype meetings with the users were the most beneficial. Clients were able to test pieces of the system and provide feedback on what fit their needs and what did not. They also gained a better understanding of what could be accomplished and what could not. For example, during one of the prototype meetings, the clients were shown a data entry form for the Content Knowledge learning goal. By testing the data entry page the clients became aware that it may not be feasible to enter the Content Knowledge data into the system. The method for entering the data via a data entry form was just as tedious as entering the data by hand. Therefore, it was decided that it is necessary to re-evaluate the means of collecting and processing the Content Knowledge data prior to automating it.

7.3 Planned End Product versus Actual End Product

End products often vary from the conceptualized product. To assess the degree of variation for the AOL system several questions will be analyzed:

- Were the stakeholder concerns met?

- Were the promised benefits achieved?
- How well did the project conform to its scope?
- Did the project perform correctly when put through the use case scenarios?
- How does the project relate to ISO 9000 standards?

7.3.1 Stakeholder Concerns

Section 4.1 Stakeholder Interviews presents the concerns of 3 stakeholders. Refer to Appendix C for the details of the interviews. The main concerns of the interviewed stakeholders were: adhering to AACSB criteria; achieving the business objectives of AOL (refer to section 4.2.2 Business Objectives); achieving consistency in performing assessments, data collection, and data dissemination; and having the data easily accessible and manipulated. Each of these concerns are discussed below.

7.3.1.1 AACSB Criteria

The AACSB mandates that schools follow a set of standards in order to be affirmed or reaffirmed as an AACSB accredited institution. These standards are meant to aid schools in enhancing the quality of student learning through improvement of school curricula and to hold schools accountable for the quality of student learning within their establishment. There are 6 AACSB standards required for AACASB accreditation. This project focused on 3 of these standards:

- Collect, analyze, and disseminate the results of assessments
- Use assessment results for the continuous improvement of curriculum
- Document the assessment process to ensure assessments are carried out in a consistent manner

For a full list of the AACSB standards refer to section 1.3 AACSB Assurance of Learning Standards.

7.3.1.1.1 Handling Data

The first standard; collect, analyze, and disseminate the results of assessments; refers to the handling of the data. Prior to the project data handling was being conducted in a vague manner. Each semester the process of collecting, analyzing, and disseminating the results changed slightly since the process was not fully documented. Results of the assessments were given to the AOL administration in various formats depending on what the AOL assessment administrators felt was necessary at the time. Swim lane diagrams for each of the learning goals (refer to Appendix G) were created to document and visually illustrate the process of preparing for an assessment, when the assessment should be given, and who should handle the results. According to the swim lane diagrams, AOL administration will notify all assessment administrators prior to the start of the semester that they are required to give an assessment. The assessment will be administered at the end of a semester. After the assessment is completed, the assessment administrators will evaluate the assessments to produce the results for the AOL administration. This process will eliminate the speculation of when an assessment should be given and when the results are due.

A standardized format for the results from faculty administered assessments was not generated. However, an ETL was created to modify the Written Communication learning goal which is administered by ETS. The ETL modifies the data to mirror the format of data in the AOL database. This modification allows the data to be automatically inserted into the database (refer to section 7.1.2 Extract Transform Load). All other learning goal results are entered through a form interface on the AOL database (refer to section 4.3.1.2 Data Entry).

7.3.1.1.2 Continuous Improvement

Parameterized chart templates to track learning trends of students were generated to address the continuous improvement standard. Three sets of charts were created: bar charts, tabular charts, and range charts (refer to section 7.1.4 Charts). These charts provide visual representations of student learning trends. The bar charts allow for a quick overview of assessment averages by term for a specified

academic year. The tabular charts provide the numerical values for the assessment averages by term for a specified academic year, while the range charts present the variations of assessment averages by term for a specified academic year. The variations span 3 standard deviations in each direction from the assessment averages.

7.3.1.1.3 Documenting the Process

The swim lane diagrams not only address the previous standard, but also the last: document the assessment process to ensure assessments are carried out in a consistent manner. The swim lanes ensure that the AOL administration handle each assessment in a fair and consistent manner. It is clearly documented when their actions, notifying students and professors of the assessment and when data collection and insertion, should be performed. A standardized process for how the assessment administrators should handle the assessments was not generated. Creation of this policy was out of scope and must be decided upon by the AOL Committee.

7.3.1.2 *Business Objectives*

The UNCW CSB AOL program aims to utilize AOL to improve student learning, have longitude tracking of student trends through the use of quality control charts, have consistent reporting of assessment results, and to have a web presence on the CSB website. Refer to section 4.2.2 Business Objectives to view a full list of the business objectives of the UNCW CSB AOL program. This project focused on the ability to track student learning trends with quality control charts, consistent reporting, and creating a web presence on the CSB website.

7.3.1.2.1 Tracking Student Learning Trends & Identifying Areas of Concern

The parameterized chart templates (refer to section 7.1.4 Charts) allow the AOL administration to track trends of student learning and identify areas of improvement. The charts present assessment averages for each learning goal and for each outcome associated with the learning goals for a specified year. This enables the AOL administration to compare data over time and determine student learning

trends for learning goals and their outcomes. Being able to filter down to the outcome level also allows the AOL administration to identify whether or not an entire learning goal needs to be re-evaluated or if a single component, or components, of that learning goal need to re-evaluated.

7.3.1.2.2 Consistent Reporting

The parameterized chart templates (refer to section 7.4.1 Reports) also ensured that all assessment results are reported in a consistent manner. Each report is generated based on a template that allows the AOL administration to select a year, learning goal, and/or outcome for the learning goal. Using parameter-based reports ensures that each report is generated in the same manner each time they are ran.

7.3.1.2.3 Web Presence

The AOL administration aimed to have a web presence on the CSB website so that the public may easily access the reports. A web presence on the CSB website was not achieved as part of this project. This will be undertaken by the CSB webmaster. The reports can be easily made public by exporting the reports via the export option in the Report Manager interface. The Report Manager is an application running on a virtual machine (xxx.xx.xx.xxx) that allows users to run reports and export reports through a web interface (<<http://xxx.xx.xx.xxx/reports>>). Once the reports are exported, if the correct permissions to post to the CSB website are obtained, they can be statically posted on the CSB website.

7.3.1.3 *Consistency in Performing Assessments, Data Collection, and Data Entry*

Consistency in performing assessments is acquired by the documentation of the process via the swim lane diagrams (refer to Appendix G). The diagrams explicitly state when the assessment preparation should occur, and when the results should be compiled.

Consistency for data collection was obtained by documenting the process of exporting third party data. Data collection for the Written Communication and Content Knowledge goals are performed by logging into third party websites and exporting the results. The steps to export the data were fully

documented in the User Documentation. The User Documentation contained screen shots and instructions to guarantee the learning goal results are exported in the same manner each time.

Consistency for reporting is attained through the use of the parameterized chart templates (refer to section 7.1.4 Reports and section 7.3.1.2.2 Consistent Reporting). Every report is generated in the same format, ensuring that the information can be accurately interpreted and compared.

7.3.1.4 Data Accessibility and Manipulation

The data in the AOL database is easily accessed through the AOL Access 2007 project user interface. Stored procedures and views permit the AOL administration to view the data without generating a query themselves. The exported data from ETS is manipulated through the use of the ETL (refer to section 7.1.2 Extract Transform Load). The AOL administration will download the ETS data and execute the ETL. By using the ETL, data manipulation by hand is eliminated and the time spent on preparing the data for insertion into the AOL database is immensely reduced. Refer to section 4.8 Success Criteria and section 7.4 Project Success for more details about reducing the amount of effort necessary to access the data and manipulate it.

7.3.2 Five Benefits

During the proposal phase of the project 5 main benefits of building the AOL system were identified: documentation, consistency, accuracy, quality, and efficiency. These 5 benefits help achieve the ultimate goal of better decision making regarding improving student learning. This is possible because having consistent, accurate reporting provides CSB with high quality information for decision making. This section will discuss whether or not the 5 benefits were achieved with the end project. Refer to section 3 Importance of The Project for a full discussion of the benefits.

7.3.2.1 Resulting Documentation

Documentation is necessary to obtain AACSB accreditation. Documenting the processes involved in the AOL system and the components of the AOL system allows the AOL administration to prove to the

AACSB that the UNCW CSB AOL program is performed in accordance with the AACSB requirements.

This project documented:

- how external entities interact with the AOL system (refer to section 4.4 Context Diagrams),
- the relationships between users and the AOL system (refer to section 4.3 Actor Diagrams),
- how the AOL system and users will perform in possible scenarios (refer to section 4.5 Use Case Analysis),
- the processes involved in administering the learning goal assessments (refer to section 4.6 Documentation of Processes),
- the architecture of the system (refer to Appendix L),
- the actual data flow in the AOL system (refer to section 7.1 Actual Implementation Data Flow Diagram),
- the inner workings of the ETL (refer to section 7.1.2 Extract Transform Load), and
- the SQL stored procedures used in the AOL system (refer to Appendix Q).

7.3.2.2 Resulting Consistency

Consistency for the AOL program stems from the formal documentation of the AOL program's processes and system and through the use of the parameterized chart templates. The documentation allows the AOL program to administer assessments and collect the assessment results in a standardized manner. These activities will no longer be carried out ad hoc. The parameterized chart templates ensure that all charts are generated in the same format, and therefore produce accurate and comparable data representations.

7.3.2.3 Resulting Accuracy

Accuracy will be achieved by adhering to the processes detailed in the documentation and by utilizing the parameterized chart templates to generate the annual reports. In doing so, all measurements will be relevant and easily compared to one another.

7.3.2.4 Resulting Quality

The quality of student learning will ultimately improve with the use of the parameterized chart templates (refer to section 7.1.4 Charts). The templates aid AOL administration in isolating areas of concern. The charts graphically represent the average scores of students of all learning goals and the outcomes associated with the learning goals. By identifying the areas of concern, the AOL administration will be able to discuss and implement alternatives to the curriculum to increase the quality of student learning for the subject matter.

7.3.2.5 Resulting Efficiency

The efficiency of the AOL administration processing the assessment results and producing the charts for the annual report has greatly increased. Prior to the project it was estimated that AOL administration spent an average of 7.5 hours on each assessment instance (refer to section 7.1.2 Terrey Hatcher). The goal for efficiency was to reduce the average time spent on an assessment instance by 50% (refer to section 4.8 Success Criteria). User testing revealed a decrease of 96.90% of average time spent on an assessment instance relating to the Written Communication learning goal and a 68.33% decrease of average time for all other learning goals. Refer to section 7.4.1 Metrics for full details of the calculations.

7.3.3 Scope

The scope of a project is often difficult to keep in check. Project managers must avoid scope creep as much as possible. Enlarging scopes can cripple a project by increasing the need for resources, funds, and time. For this project the scope remained fairly consistent (refer to Appendix D Project Charter). Only a few things changed from the original scope:

- the ETL for the content knowledge learning goal was not built,
- the control charts were changed to range charts,
- the charts do not allow for drilling down to the course or course section,
- the backup Excel macro was not created, and
- an internal website was built to handle the uploading of ETS exports and executing the ETL.

7.3.3.1 Content Knowledge ETL

The ETL for the content knowledge goal was not completed due to the learning goal being omitted from the database for the time being. The learning goal was omitted due to concerns with grading the content knowledge surveys in order to calculate the values for the AOL Response table.

7.3.3.2 Control Limit Charts

The control charts were changed to range charts to better illustrate the variations in the trends of student learning. The original control charts utilized upper, lower, and center lines to establish whether or not the average scores were out of bounds (refer to section 4.7 Prototype Charts). These charts were difficult to read due to the control limits being so close together (refer to Figure 30). The range charts (refer to section 7.1.4.2. Range Charts) present a range of 3 standard deviations for each semester. Presenting the data in this form enables the AOL administration to make better decisions since the charts are easier to interpret versus the control limit charts.

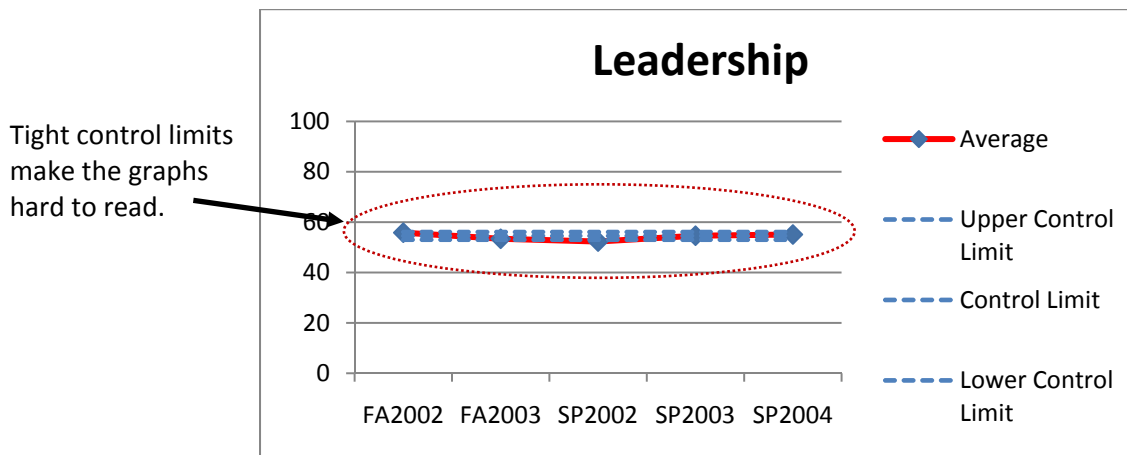


Figure 29 Control Limit Chart

7.3.3.3 Drill Down Capabilities of Charts

The parameterized chart templates do not allow users to drill down to the section level of courses as originally intended. The data in the AOL database presently does not support this because only the major of the respondents are currently being tracked. However, charts have been built to drill down to the

major. Once the course and course section are captured along with the major, chart templates could be constructed to further pin point areas for improvement.

7.3.3.4 Excel Macro

The backup Excel macro for the ETL was not built due to the ability of Integration Services to handle all of the necessary steps required by the ETL. Roughly 30 hours was spent on researching and learning VBA code to write the macro. The complexity of VBA made the macro more complex to build versus building an ETL in Integration Services.

7.3.3.5 CSB Web Presence

The AOL administration would like to have a web presence on the CSB website. The web page would be publically available and display static versions of the charts used in the annual report. Having a web presence on the CSB website was included under the “Niceties” section of the project charter (refer to Appendix D). The web presence was not built as a part of this project; however, the Report Manager from Reporting Services allows charts to be exported in various formats. These exported reports can easily be posted on a web page, by the CSB webmaster, in the future.

7.3.4 Use Case Testing

Three use case scenarios were created to test the AOL system once it was completed (refer to Appendix H). The 3 scenarios were: an AOL administrator entering outcome results into the AOL database, an AOL administrator extracting assessment results from ETS, and the ETL modifying and inserting data into the AOL database. The AOL system passed the first 2 scenarios at 100%. The last scenario, the ETL modifying and inserting data into the database, also passed at 100% but differed in that in addition to the scenario steps, the ETL adds data to 2 tables: the ETSDData table and the ETSTemp table. The use case scenario only described the ETL appending data to the ETSDData table. The ETSTemp table was added to aid in the data manipulation process. Placing the data into a temporary

table allowed a cursor to loop through the new data versus searching the raw data table, which holds historical data, for the information.

7.3.5 ISO 9000

The International Organization for Standardization (ISO) maintains “a family of standards for quality management systems” (Wikipedia, ISO 9000) known as ISO 9000. The purpose of the ISO 9000 standards are:

- To ensure desirable characteristics of products and services
- To make the development, manufacturing, and supply of products and services more efficient, safer, and cleaner
- To facilitate trade between countries and make it fairer
- To provide governments with technical base for health, safety and environmental legislation, and conformity assessment
- To share technological advances and good management practice
- To disseminate innovation
- To safeguard consumers and users in general of products and services
- To make life simpler by providing solutions to common problems (ISO, Discover ISO)

The ISO 9000 standards are voluntary and market driven, but provide brand imaging of an efficient and effective organization. The main driving force behind these standards is formal documentation of the organization, its policies, and its processes. The ISO 9000 standards also separate into smaller sub-sections of standards.

The AOL project closely relates to the Management standards of ISO 9000. The management standards can be applied to any organization in any sector of activity (ISO, International Standards for Business, Government, and Society). This sub-section of standards provides a model, plan-do-check-act, to aid organizations in setting up and operating their management systems. The model is a cycle of establishing objectives, making plans to achieve the objectives, implementing those plans, measuring the

results of how far the organization's achievements have met the planned objectives, correcting and improving the plans and finally putting them into practice. Figure 31 shows the plan-do-check-act model.

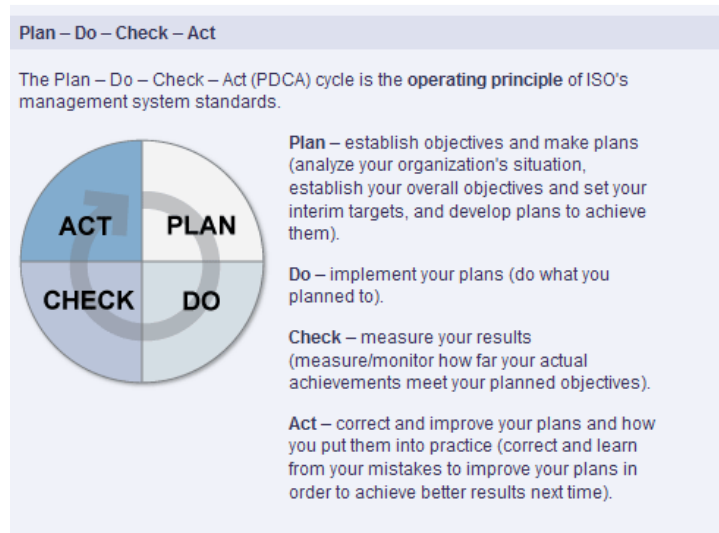


Figure 30 ISO 9000 Management Standards Plan-Do-Check-Act Model

The UNCW CSB AOL program follows this model. Learning goals have been established for students (plan), assessments of these learning goals are monitored to assess student learning (do), the assessments are measured (check) and interpreted to identify areas of improvement, and once areas of improvement are defined curriculums are modified (act) to improve student learning. Furthermore, this project has documented the AOL system in its entirety including the processes for administering the assessments, and is thus in line with the ISO 9000 standards.

7.4 Project Success

The project was measured on two things: the reduction in average time spent on assessment instances and the satisfaction of the stakeholders (refer to section 4.8 Success Criteria). The reduction in average time spent on an assessment instance was calculated by comparing the average time the AOL administration spent on assessment instance prior to the project and the time it took to complete an assessment instance during user training. Stakeholder satisfaction was evaluated by giving the stakeholders a survey to rate their satisfaction and perception of the project's success post completion.

The overall success rate of the project is 91.14%. This value was calculated by averaging the average metric success rate (82.62%) with the average stakeholder satisfaction rate (99.7%). Refer below for the full metric and survey calculations.

7.4.1 Metrics

Prior to the completion of the project, the AOL administration spent an average of 7 hours on an assessment instance. For an assessment instance the AOL administration prepares for an assessment, organizes the results for data entry, enters the data into the database, and consolidates the data to generate reports. The metrics will only be based on the average times for data organization, data entry, and report generation. Preparation for the assessments will not be included for comparison since it is not an aspect of the process that was automated.

Below are the calculations used to produce the percentage change of for the time spent on each assessment instance prior and post-implementation. Several assumptions were used in calculating the percentage change:

- Organizing data
 - Written Communication learning goal: 3 minutes to complete (Organizing data for the Written Communication learning goal consists of logging into ETS website and exporting the data)
 - All other learning goals: 2 hours (based on Terrey Hatcher's estimation in section 4.8 Success Criteria)
- Data entry
 - Written Communication learning goal: 2 minutes to complete (Data entry for the Written Communication learning goal consists of logging into the ETS Upload website, uploading the ETS file, and executing the ETL)
 - All other learning goals: 25 minutes (This assumes a class of 25 students and 1 minute per data entry form per student)

- Report generation takes 8 minutes to complete (This assumes 1 minute to login to Report Manager, 3 minutes for exporting, and that 4 reports are ran averaging 1 minute per report)

The percentage change was calculated by first converting all of the time units to a common time unit. The time unit chosen was hour. The time spent on the assessment instance in minutes was divided by 60 minutes to convert to the hour time unit ($\frac{Minutes}{60\ minutes}$). Once everything was in a common time unit, the hours spent on the Post learning goals were divided by the hours spent on the Prior learning goals and multiplied by 100 to find what percent they were of the Prior time

($\frac{[Post\ Hours]}{Prior\ Hours} * 100$). After the percentages were calculated they were subtracted from

100 to find the percentage increase in efficiency ($100 - \% Prior\ Avg$).

The overall average of the two percentage changes, Written Communication and all other learning goals, is used to rate the success of the time reduction. The overall average for time reduction is 82.62%.

	Avg Time		% Prior Avg	% Change	
Prior	min	hrs			
All learning goals	420	7			
Post					Overall Avg
Written Communication	13	0.22	3.10	96.90	82.62
Other learning goals	133	2.22	31.67	68.33	

7.4.2 Survey Responses

A subset of stakeholders received short surveys, tailored to each of the stakeholder’s involvement in the project, to evaluate their satisfaction with the project. They were asked to rate the project deliverables, and the approach to project management on a scale from 1 to 10. Refer to section 4.8 Success Criteria. The subset of stakeholders consisted of Dr. Porterfield, Ms. Terrey Hatcher, and Dr.

Kline. Originally Dr. Larry Clark was included in the subset, but was omitted from the subset because his survey pertained to the evaluation of the system and documentation while engaging in the assessment process from start to finish. When the project was delivered assessments had already begun and therefore, the survey was no longer applicable.

Below is the full list of questions and the average answer for each question. The answers were determined by averaging the scores given from all stakeholders that answered that particular question.

All questions will be noted with a TH for Ms. Hatcher, RP for Dr. Porterfield and DK for Dr. Kline.

<u>Question</u>	<u>Stakeholders</u>	<u>Average Score</u>
The project manager provided adequate communication throughout the project.	TH, RP, DK	9.67
You fully understood the scope of the project.	TH, RP*, DK	10
The format of the chart templates are exactly what you asked for.	TH, RP, DK	10
The project progressed in a timely fashion.	TH, RP, DK	10
The productivity of project meetings was satisfactory.	TH, RP, DK	10
You received ample user training.	TH, RP*, DK	10
The time it takes to create charts was greatly reduced.	TH, RP, DK	10
The Extract Transform Load makes data entry easier than before.	TH, RP, DK	10
The standard format of the outcome results is satisfactory.	TH, RP, DK	10
The data entry screens are satisfactory.	TH, DK	10
The documentation created for the AOL program is very helpful.	RP, DK	10

*RP – No numerical response was given. Comments were provided. Refer to Appendix K.

Based on the scores provided, the overall success rate for stakeholder satisfaction is 99.7%.

8 Predictions Revisited

In this section I will give my subjective opinion of the 3 predictions made at the beginning of the project (refer to section 5 Predictions). The assumptions were that it may be difficult to find common ground between all of the stakeholders, Reporting Services may not have the ability to perform what is needed for the ETL, and the control limits in the control limit charts may be difficult to implement.

8.1 Stakeholder Management

Reaching an agreement between the end users and the client was not as complicated as anticipated. There were clear differences in opinions on what was necessary to adhere to AACSB requirements and what the stakeholders would like to have regarding the charts. The main conflict revolved around the control limit charts: what is an appropriate time span for the moving average, and could bar charts be implemented along with the control limit charts.

I believe that stakeholder management was made easier because I used a personal approach with the stakeholders and I used prototypes to illicit feedback. My approach to the stakeholders consisted of interviewing them on an individual basis and afterward keeping in frequent contact. The stakeholders were interviewed individually to mitigate stakeholders from withholding concerns. Often the presence of others, especially superiors, during the initial interviews causes stakeholders to withhold concerns. Once the collective and individual concerns were finalized, I kept in frequent contact with the stakeholders. This was done to guarantee that everyone was on the same page and understood what the project was about.

Prototypes were used to create an understanding between all parties involved in the project. I used prototypes for the Reporting Services charts and the content knowledge data entry form. By showing the stakeholders what the charts/forms would look like and how they would function, the stakeholders gained a better understanding of what could and could not be accomplished. A great example of this is when I showed the content knowledge data entry form to the AOL administration. The content knowledge data entry form proved to be just as tedious as manually entering the learning goal's raw data into the AOL database. This revelation spurred the AOL administration to rethink how they are conducting the content knowledge assessment.

8.1.1 Changes to the Control Limit Charts

Originally the control limit charts were to reflect assessment averages over a period of time (refer to section 4.7 Prototype Charts). Several factors are involved in deciding how the control limits

would be calculated. The stakeholders did not reach an agreement on the factors affecting the control limits, such as the number of periods used to calculate a moving average. It was unclear whether the number of terms used to calculate the moving average should be 4 or 5. The dilemma was resolved when the control limit charts were replaced with range charts. Range charts do not utilize a moving average, thus nullified the conflict.

I believe this was resolved by employing the personal approach mentioned earlier in section 8.1 Stakeholder Management. I solicited the stakeholders' apprehensions about the charts and then discussed the issue with the stakeholders until a solution was reached. Based on these discussions, the stakeholders opted to replace the control charts with range charts. The range charts were chosen because they display the average of the assessments with a range of 3 standard deviations without the complications of calculating control limits. Stakeholders can graphically see changes in student learning trends. The ranges expand and shrink as trends change over time. Refer to section 7.1.4.2 Range Charts for an example of a range chart and the dynamic ranges

8.1.2 Bar Charts

During the project execution phase the end users requested that bar charts be added to the list of parameterized chart templates implemented. Bar charts were included because they are relatively easy to create and provide a quick overview of the data. Bar charts enable the internal stakeholders, such as the AOL administration and the CSB faculty, to quickly glance at the data and ballpark learning goals that may need attention. The bar charts, however, do not show deviations from the norm in great detail. The stakeholders must utilize the range and course filtered charts to pinpoint areas for improvement. I believe that the bar charts provide a great abstract view of the assessments, but control charts should eventually be added. Control charts will show the changes in the learning trends over time and clearly show outlying points. Range charts only show 3 standard deviations from the averages. Rogue points of data could be missed by exclusively looking at a range chart.

8.2 Reporting Services

My main concern of using Reporting Services was generating control limits for the charts. The stakeholders decided not to use control limit charts which eventually rendered this concern null. All of the charts were built through Reporting Services drag and drop interface. The only difficulty I experienced while building the charts was implementing the parameters. Reporting Services had 3 different locations to edit and build parameters, and it is confusing which location is the correct one to create and configure parameters. I found the simplest way to add parameters to charts is to write SQL statements for querying data for the reports that incorporate the parameters. If the SQL statements contain parameters, Reporting Services will automatically create the parameters in a parameter folder allowing for easy configuration.

In my opinion Reporting Systems is an extremely useful tool and was not a hindrance as predicted. The drag and drop interface made virtually effortless to generate a chart. One only has to write a query for filtering the data, choose a chart type from the tool menu, and drag the data fields on to the chart. The ease of generating charts allows anyone to create a chart on the fly.

8.3 Control Limit Charts

It was predicted that coding the control limits for the control limit charts would be difficult. This prediction is no longer applicable since the stakeholders decided against including control limit charts in the project (refer to section 8.1.1 Changes to the Control Limit Charts).

I believe control charts are still a necessary addition to the chart templates. The bar charts will only display the averages of the assessments. The range charts only display the assessment averages and a range of 3 standard deviations. Control charts, on the other hand, will pin point outlying data points along with a moving average of the assessment scores. This is crucial for fully understanding student trends. Moving averages will track changes in the learning trends over time. AOL administration will be able to use as an audit trail for the highs and lows of the learning trends. The control limits of the charts will

serve as boundaries for isolating acceptable averages of the assessment score averages. Clearly marking the limits for tolerated data will aid in identifying trouble areas.

9 Retrospective

This section will present what was learned during the course of the project.

9.1 What Was Learned

9.1.1 Visual Basic for Applications

Visual Basic for Applications (VBA) is an implementation of Microsoft's Visual Basic (VB). Although VBA is an implementation of VB, it often can only run code within a host application, such as Excel. VBA is used to control many of the aspects of a host application. The macro in Excel that was originally to be built utilized VBA to sort through columns of data and truncate the data to match the format of the AOL database. The macro searched columns in the dataset to match keywords from the correct answers to the survey. Once the correct and incorrect answers were identified the macro calculated scores for each student. This syntax was very verbose. Similarly, the VBA syntax to mimic the functionality of the ETL was very verbose and therefore the Excel macro containing VBA code was eliminated from the project.

What I learned from using this tool is that VBA is used in a variety of applications, the syntax of VBA, and its complexity. VBA is used in everyday applications such as Excel and Access and thus, being exposed to the syntax of VBA is very valuable. Most organizations use Microsoft Office tools. Being able to work with VBA is an integral part of most jobs. I am confident, as a result of the exposure to the VBA syntax, that I am able to receive a project in VBA and not only understand the code but also to work with it. Although I learned some VBA syntax rather quickly, VBA can be complex. I used VBA to script an ETL in Excel. The amount of code to sort through data in columns and rows rapidly became verbose. In the end it was easier to build the ETL in SSIS versus Excel.

9.1.2 SQL Cursors

Cursors are a database object that is used to manipulate data by rows (Sufyan). Cursors are used to return a result set based on a table in the database without returning the table itself. An explanation of how the AOL ETL cursor functions follows.

The cursor in the AOL ETL selects a row of data at a time from the ETSTemp table. The column holding the class and major information is sub stringed to produce a match to the major code in the major table. This match is stored in a parameter. Likewise, the column containing the date of the ETS survey is examined to determine the month, and therefore the semester, the survey took place. This information is also stored in a variable. The cursor then inserts the information contained in the parameters into the Respondent table. Once entered in the table, an automatic Respondent ID is generated. The cursor retains this ID in another parameter and returns to the current row of data. The retained Respondent ID and the student's score for the written communication goal are inserted into the Response table, after which the cursor moves on to the next row of data in the ETSTemp table.

Building the cursor taught me the process from start to finish. Cursors must be declared, initiated, and de-allocated. The declaration makes the cursor "known" to the DBMS. Once a cursor is officially declared it must be activated with an open statement. Following the opening of the cursor, the cursor is positioned before the first row of data. After a cursor is initiated with open statement, a fetch statement is used to position the cursor on a specific row. A fetch operation then transfers the data of the row into the application. After all of the available rows have been processed, a close statement closes the cursor. Even though the cursor has been closed it can be reopened since it is still tying up resources. It is very important to de-allocate the cursor so that the resources are freed.

9.1.3 Generating an ETL with SQL Server Integration Services

SSIS is used to extract data, transform the data, and load the data into data source. It is often used to automate the maintenance of a SQL Server database. SSIS was used to build an ETL that would take the ETS data exports, modify them into a usable format for the AOL database, and insert the data into the

AOL database. ETLs are comprised of workflow and process tasks. These tasks instruct the ETL on what should take place (refer to section 7.1.2 Extract Transform Load). When the AOL ETL is executed the first work flow task is to locate the exported file. Once the file is located, the ETL inserts the data into the ETSTemp table and appends the data to the ETSTemp table. After the data is inserted or appended to the respective tables, a stored procedure that contains a cursor is called to manipulate the data in the ETSTemp table, insert it into the Respondent and Response tables, and then clear the data out of the ETSTemp table.

I found the SSIS interface to be very user friendly. I had little trouble navigating the interface and creating the ETL. One of the best aspects of SSIS is that it has many options to choose from to handle even the most intricate transformations of data. Another great feature is that SSIS employs a wizard to walk users through setting up the sources and destinations of data. The wizard has users browse to where the data source is located and likewise for the destination. After the source(s) and destination(s) are established users utilize a tool box to define the tasks the ETL is to perform from the vast amount of tools. The tool box is extremely organized and allows users to drag and drop tasks onto the interface. Once tasks are in place, users can double click on the tasks to configure them. Users can also determine the sequence of events by using connectors between the tasks. When tasks are added to the interface a green arrow appears. The green arrow symbolizes the flow of data. If a user clicks on this arrow they can drag it to another task and connect them together establishing the directional flow of the data. All of this can be accomplished with little understanding of the software. I did minimum research on building ETLs in SSIS and was able to understand enough of the program to build the ETL by simply trying out the software.

9.1.4 Creating Parameters with Reporting Services

Reporting Services utilizes a web interface to create, view, and manage reports. There are numerous reports that can be built using Reporting Services, but this project focused on creating parameter based reports. I learned that parameters can be generated in 3 different ways in Reporting

Services: via SQL queries, manually adding the parameters to the parameter folder, or by manually adding parameters via the parameter tab while configuring the charts. Through trial and error I decided to add parameters by using the first option: constructing SQL queries that incorporated parameters. This method is the simplest and most efficient. Whenever a query was implemented that contained parameters, Reporting Services would automatically add the parameters to the parameter folder. A user only has to assign the values available to the parameter. This was done by double clicking on the parameter and selecting a data source that held the parameter values. Once the parameters were configured properly, a drop-down list would appear on the report interface. Users use the drop-down lists to filter the data used to generate the charts

9.1.5 Using Business Standard Tools

This project taught me how business standard tools can be used to achieve business objectives. Too often organizations fail to recognize which tools are considered a business standard and which tools are necessary to achieve the organization's objectives. This failure causes many organizations to spend an immense amount of funding to build customized solutions in house or outsource for the customized solutions. The tools I used in this project; SQL Server, Reporting Services, and SSIS; are business standard tools. To fully comprehend the capabilities of the tools I researched their abilities prior to building the project. Understanding the full potentials of these tools enabled me to reach the goals of the project: automating the data entry and providing structure and consistency to the processes and reports.

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Appendix

APPENDIX A – Glossary

AACSB

Association to Advance Collegiate Schools of Business

The AACSB was founded in 1916 for the purpose of accrediting business schools worldwide based on the quality of their management education and accountancy. Currently the AACSB accredits 554 institutions worldwide.

Assessment

Assessment is the process of documenting knowledge, skills, attitudes, and beliefs.

<http://en.wikipedia.org/wiki/Assessment>

Assurance of Learning

A clearly defined process to continually improve the learning outcomes of skills, knowledge, and perspective for all business students to better prepare them for the ever changing business world in which they will work.

Assurance of Learning Committee

The AOL Committee is a committee that oversees the assessment of learning goals and objectives at UNCW's Cameron School of Business. Specifically, the committee interprets the results of the assessments, generates recommendations for improvement based on the assessments, and compiles a report containing the state of the business school and their recommendations.

Learning Goals

Learning Goals are the general educational aims of the program. They are a direct reflection the school's mission statement. The purpose of establishing learning goals is to demonstrate what the students will learn.

The Assessment Process

http://www.aacsb.edu/resource_centers/Assessment/ov-process-define.asp

Measurement Tool

Tool used to assess the performance of students such as a rubric or third party.

Objectives

Objectives are used to express intended results in precise terms. Further, objectives are more specific as to what needs to be assessed and thus are a more accurate guide in selecting appropriate assessment tools.

Objectives for Learning

http://www.aacsb.edu/resource_centers/glossary/objectives_for_learning.htm

Rubric

A rubric is an explicit summary of the criteria for assessing a student's work.

The TLT Group

<http://www.tltgroup.org/resources/flashlight/rubrics.htm>

Strategy Committee

The Strategy Committee is a group with the sole purpose of providing strategic guidance to the Cameron School of Business. Although the committee provides guidance, they do not make decisions regarding CSB's strategies. The Strategy Committee consists of the Dean, Associate Deans, Department Chairs, and additional faculty members.

APPENDIX B – Undergraduate Learning Goals

Learning Goal 1:

Our students will be able to integrate discipline-specific knowledge across functional areas and utilize leadership and team skills to accomplish group tasks.

Learning Goal 2:

Our students will demonstrate critical thinking and problem solving skills through problem identification, analysis and synthesis of data, evaluation of alternatives, and defense of a solution.

Learning Goal 3:

Our students will be able to conceptualize a complex issue into a coherent written statement and oral presentation, demonstrated with the effective use of technology.

Learning Goal 4:

Our students will understand the importance of social responsibility, diversity, ethics and legal issues.

Learning Goal 5:

Our students will demonstrate an understanding of global business practices that embraces the opportunities of multicultural, diverse environments, as they relate to local, national, and global operations.

APPENDIX C - Interviews

Dr. Rebecca Porterfield

1. What are your objectives of AOL?
 - a. To improve student learning.
 - b. The ability to have “longitudinal” tracking through the use of quality control charts.
 - c. To be able to identify areas of improvements based on the charts.
 - d. To have consistent reporting.
 - e. To have a web presence.
 - i. Display AOL findings on the CSB web site.
2. Who uses the AOL system?
 - a. Faculty
 - b. AOL Committee
 - i. Strategy Committee
 - ii. Curriculum Committee
 - iii. Professors
3. What are the criteria for the AOL system?
 - a. To produce an AOL report establishing the learning goals, actions taken to improve students’ learning, and results of those actions.
 - b. The Graduate program is currently absent from the reports and needs to be added.
4. What types of reports need to be generated?
 - a. Public reports
 - i. Control charts
 1. Tracking of learning goals.
 - b. Private reports
 - i. Data mining all the way to the academic department and course.
5. Do additional reports need to be created?
 - a. No additional reports need to be created.
 - b. Would like to have the reports automatically generated.
6. How many times do you extract the data?
 - a. Semi-annually.
 - b. Once a semester (Fall and Spring only)
7. Are there any constraints?
 - a. The students and faculty members can not be identified based on the data.
 - b. The only exception is for the MBA peer assessment where it is necessary to ID the students.
 - i. Students are given arbitrary numbers and are not identified in any form on the “public” reports.
8. What are the current issues of the system today?
 - a. The processes of administering the surveys/writings/etc are not consistent.
 - i. Some professors offer incentives, others place low priority on AOL research.
 - b. Would like to move to a sample size for tracking the learning goals.
9. What is the AACSB looking for?
 - a. The AACSB is looking for CSB to gather the data, measure against the rubrics, and “close the loop.”
 - i. Closing the loop – having processes to make changes necessary to improve.
10. How are the reports used?
 - a. Currently the reports are posted on Sammy.
 - b. Want to post the reports on the CSB web site.

11. Extra.
 - a. Data
 - i. Manually gathered and put into reports.
 - b. Writing (ETS)
 - i. Uses outside sources to assess the writing samples.
 - ii. Would like to be able to have the data migrated from the ETS web site to the data base.
 - c. Administering Evaluations
 - i. Uses a tickler file
 - ii. Would like automatic emails sent out to remind professors to administer the evaluations.
 - d. Rubric
 - i. Scale from 0-4.
 - ii. Why?
 - e. Received AOL plan & sample reports.

Ms. Terrey Hatcher

1. How often is the data extracted to generate the reports?
 - a. The reports are generated every semester.
 - b. The data entry is ongoing.
 - c. Data often comes in batches.
2. Is there a need for additional gathering methods?
 - a. Would like to be able to gather the MSA exit surveys electronically.
3. Who are the users of the system?
 - a. Ideally only the administrators and their student workers.
4. How are the reports used?
 - a. The reports are only supposed to establish the trends in the learning goals and the actions taken to improve.
 - b. The information is not supposed to be graded; however, some departments use the information obtained to grade (MBA).
5. Extra.
 - a. There are missing metric scores.
 - i. Need a category for “no answer”
 - b. Need to increase the number of responses to the evaluations.
 - c. Training
 - i. The users need to be training once the new data warehouse is up.
 - ii. The professors need to be trained on the processes of gathering and submitting data.
 - d. Need to group the MBA stats.
 - e. Need a database entry for the writing essays.
 - f. Would like to have the excel files transfer to the database automatically.
 - g. There are different oral categories for the MSA program.
 - i. Needs to be uniform with everyone else.

Dr. Janicki

1. How does the AOL program affect you?
 - a. MIS 413 needs to take the writing assessment.
2. When are you notified that you need to administer the assessment?

- a. Notified in the middle of the semester.
- 3. How are you notified?
 - a. The AOL administration sent out notification.
- 4. Does this take away time from the class?
 - a. No.
 - b. Sent students to take the assessment on their own time.
- 5. Do you have to leave things out of the syllabus because of the AOL program?
 - a. No.
 - b. See above answer.
- 6. How long does the assessment typically take?
 - a. Not applicable.
 - b. Didn't monitor the actual assessment.
- 7. Does this process work for you?
 - a. No.
 - b. There needs to be a consistent manner for assessing students.
- 8. Is there anything you would change?
 - a. Make the assessment process consistent.

APPENDIX D – Project Charter

Problem

The Cameron School of Business at UNCW needs a consistent reporting system for the Assurance of Learning reports for the AACSB accreditation.

Business Objectives

The business objective of UNCW’s Cameron School of Business and the Assurance of Learning Committee.

- Utilize AOL to improve student learning
- The ability to have longitude tracking through the use of quality control charts.
- To be able to identify areas of improvements based on the charts.
- To have consistent reporting.
- To have a web presence on the Cameron School of Business Website.

Stakeholders

Listed below are the stakeholders of the project and how they relate to the project.

Stakeholder

Dr. Rebecca Porterfield
Terrey Hatcher
Dr. Larry Clark
Dr. Doug Kline
AOL Committee
AACSB

Relation

AOL Committee Chair
Program Assistant
Dean of Cameron School of Business
Client/AOL Committee
Assurance of Learning Committee
Association to Advance Collegiate Schools of
Business/provides accreditation

Scope

The scope section lists what will be included in the final project (Included), what will not be included in the project (Excluded), and what may be included in the project if time permits (Niceties).

Included in Project

- The Assurance of Learning for the undergraduate program at UNCW.

Excluded from Project

- The Assurance of Learning for the graduate program at UNCW.

Niceties

- Creating a web interface for AOL to load information and view reports.

Constraints

The items below may inhibit the progress of the project to some extent.

- Time
 - Due by May 15, 2009
 - Scheduling work in tight schedules
- Resources
 - Sarah Peck
 - Limited time
 - Stakeholders
 - Limited time

Milestones

This section lists the milestones and anticipated due dates.

<u>Milestone</u>	<u>Target Date</u>
Project Charter	10/1/2008
Project Plan	12/3/2008
Project Execution Initiated	1/14/2009
Project Execution completed	4/22/2009

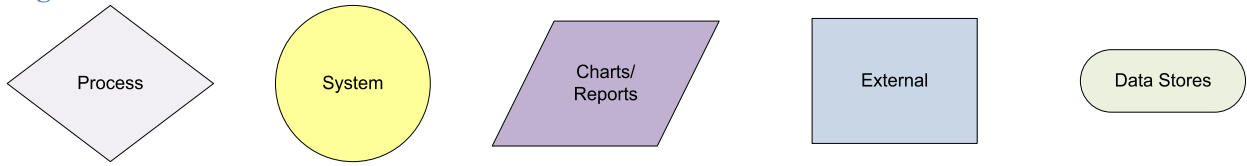
Resources

The resources used for the project and their responsibilities to ensure the success of the project.

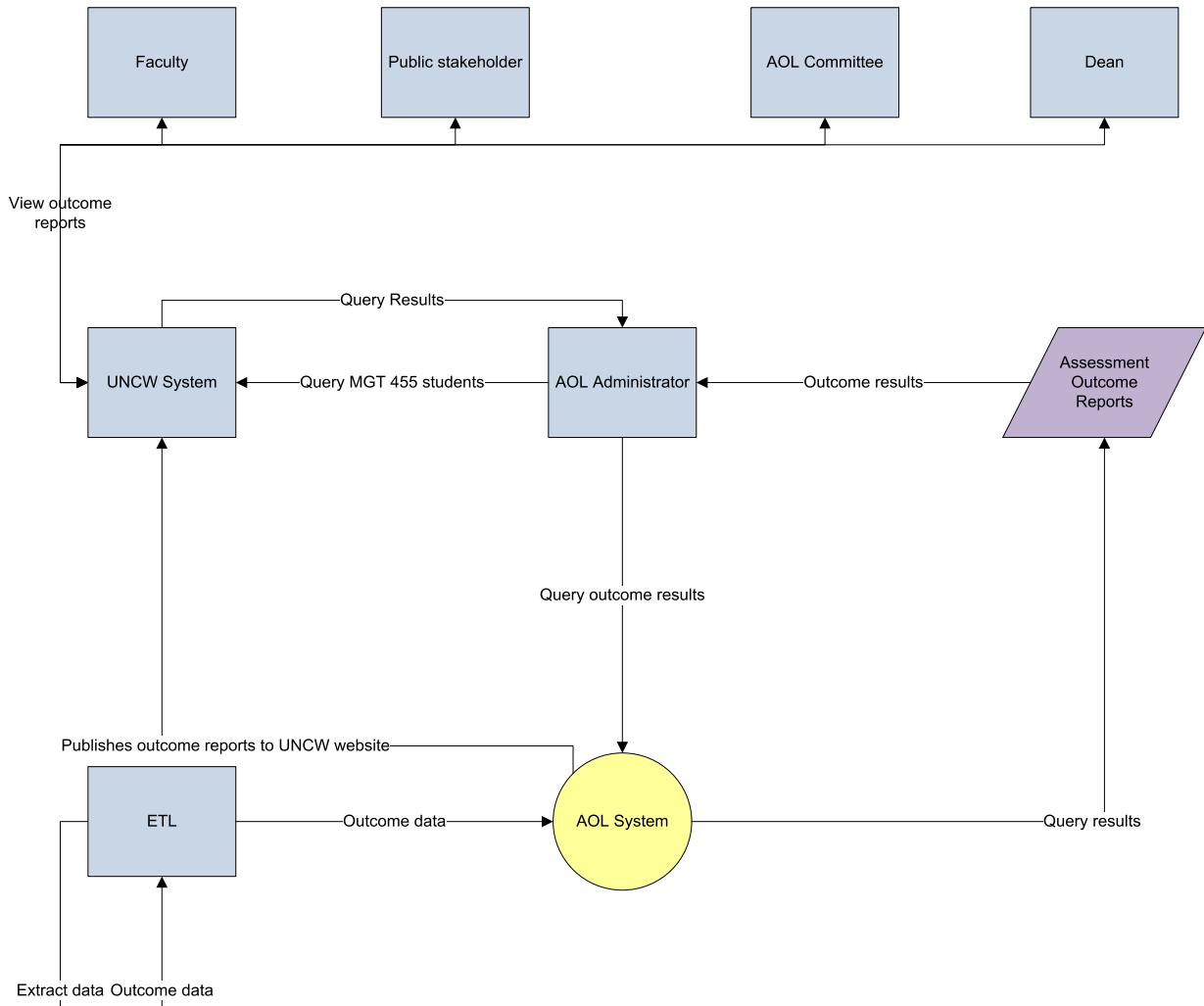
<u>Resource</u>	<u>Responsibility</u>
Dr. Rebecca Porterfield	Provide information/business requirements
Terrey Hatcher	Provide information/business requirements
Dr. Doug Kline	Client/business/functional requirements/ Capstone Committee
Sarah Peck	Design/implement the project
Dr. Bryan Reinicke	Capstone Committee chair
Dr. Devon Simmonds	Software engineering consultation/ Capstone Committee
Dr. Drew Rosen	Project management consultation/ Capstone Committee
Microsoft Access	Database software for AOL database
SQL Server	Backend of database
SQL Server Reporting Services	Report generation tool

APPENDIX E – Context Diagrams

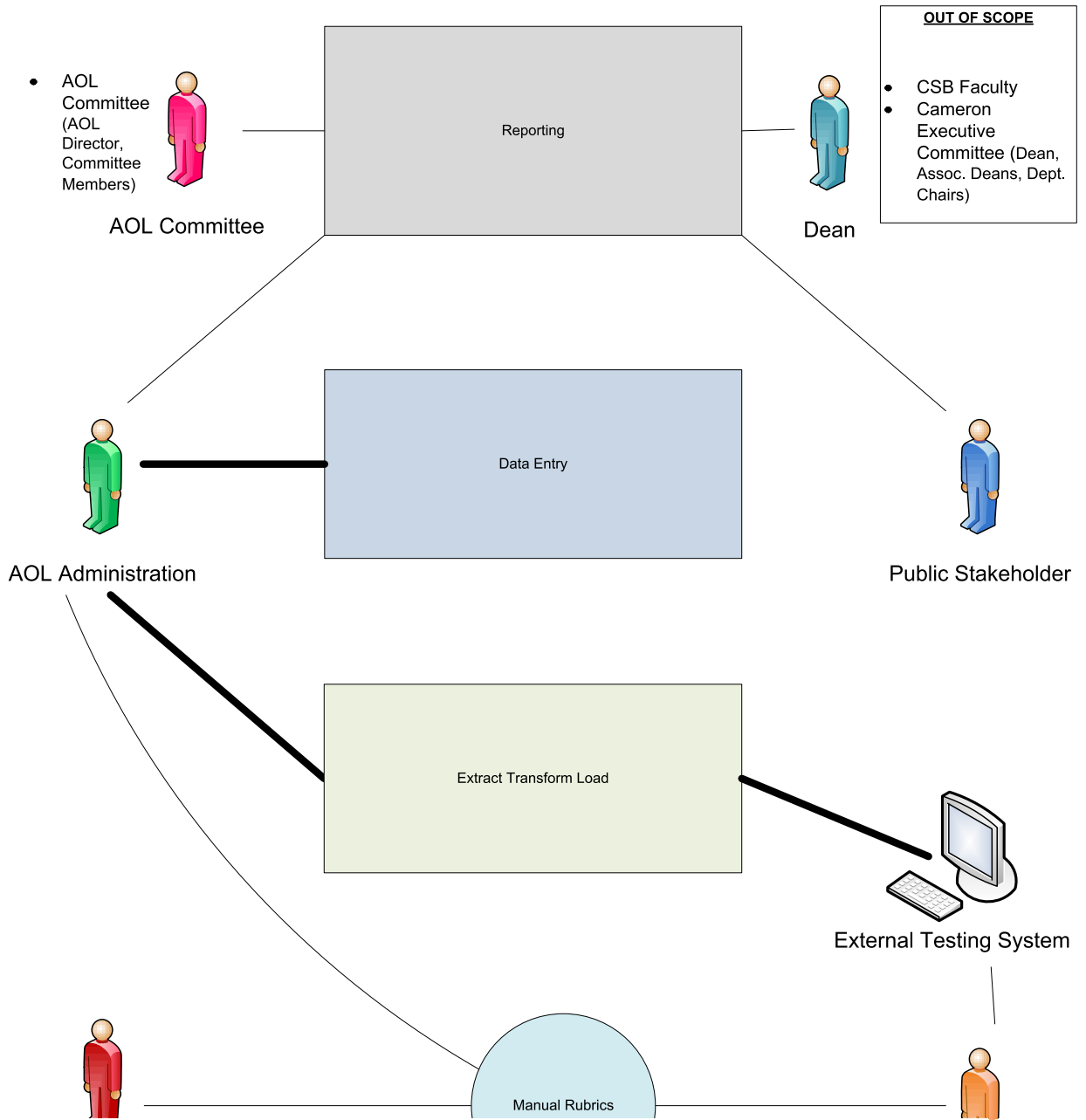
Legend



Context Diagram

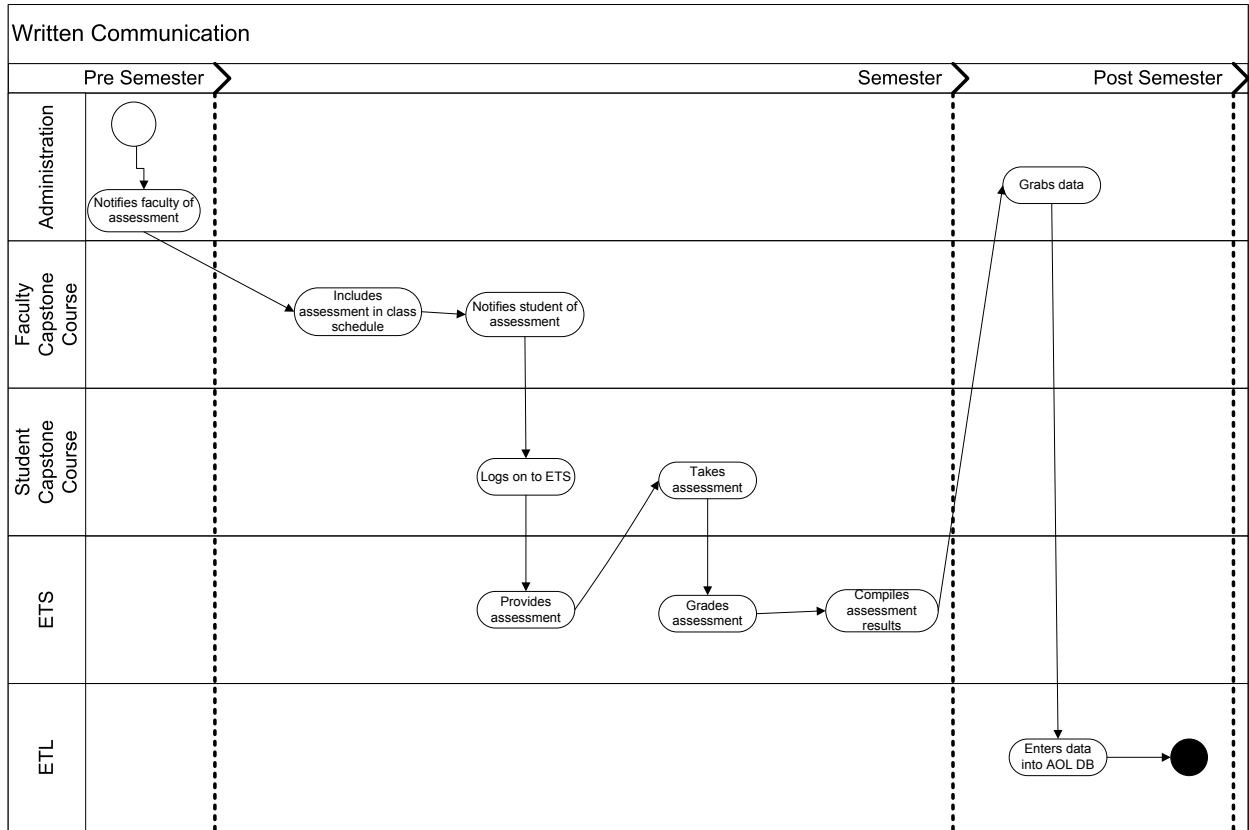


APPENDIX F – Actor Diagram

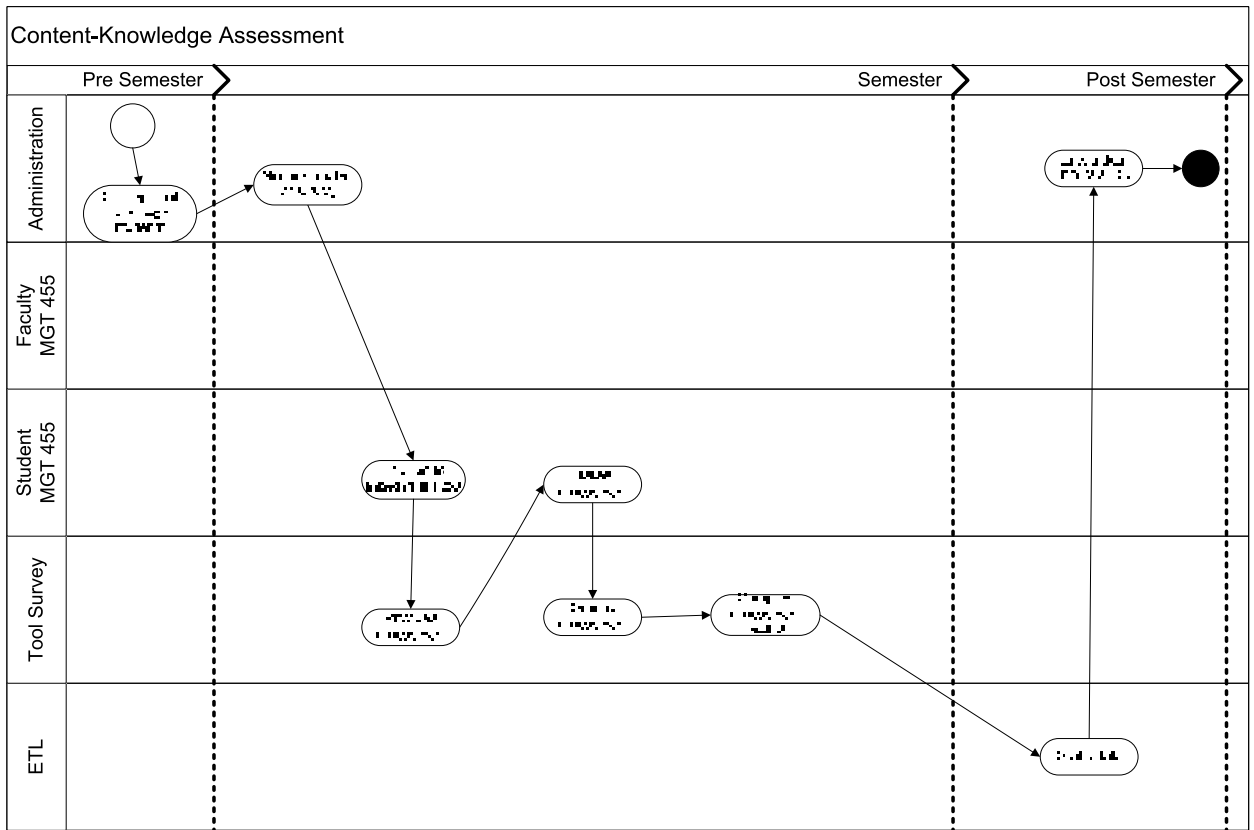


APPENDIX G – Swim Lanes

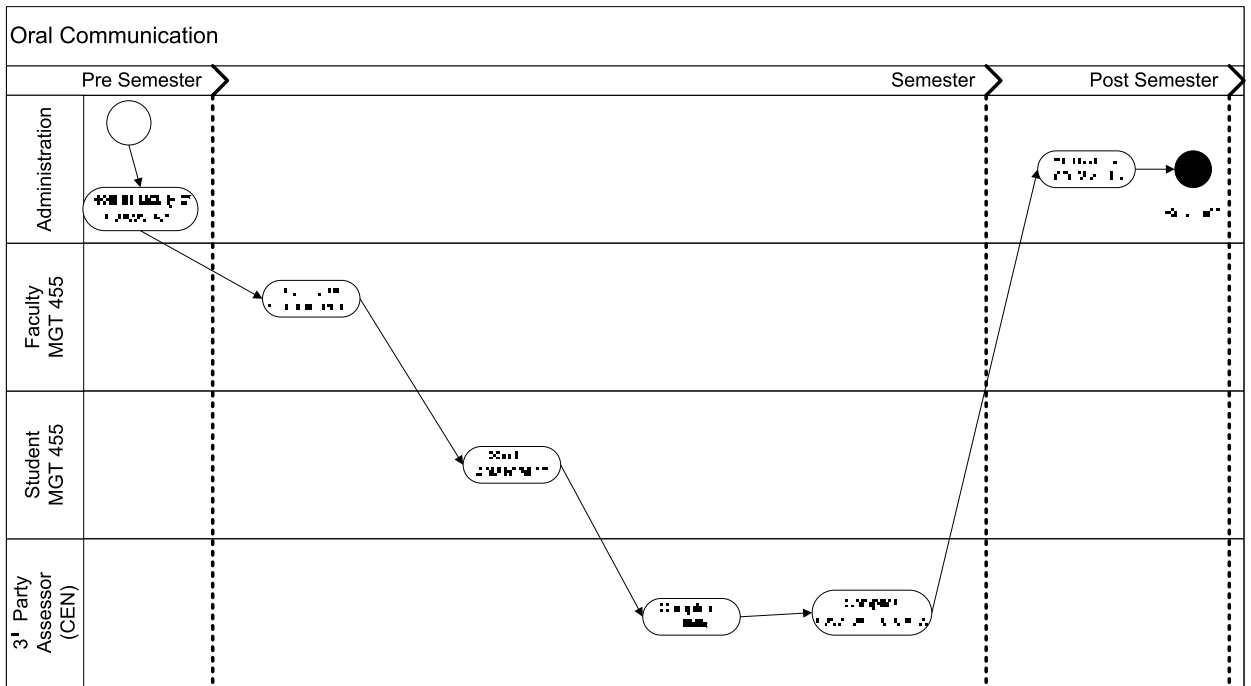
Written Communication



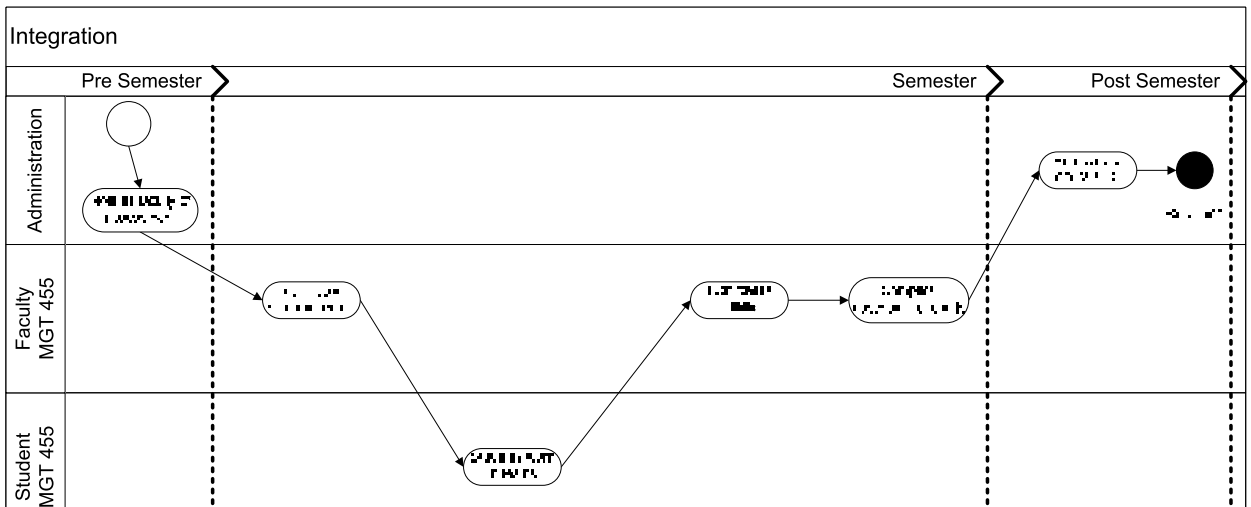
Knowledge



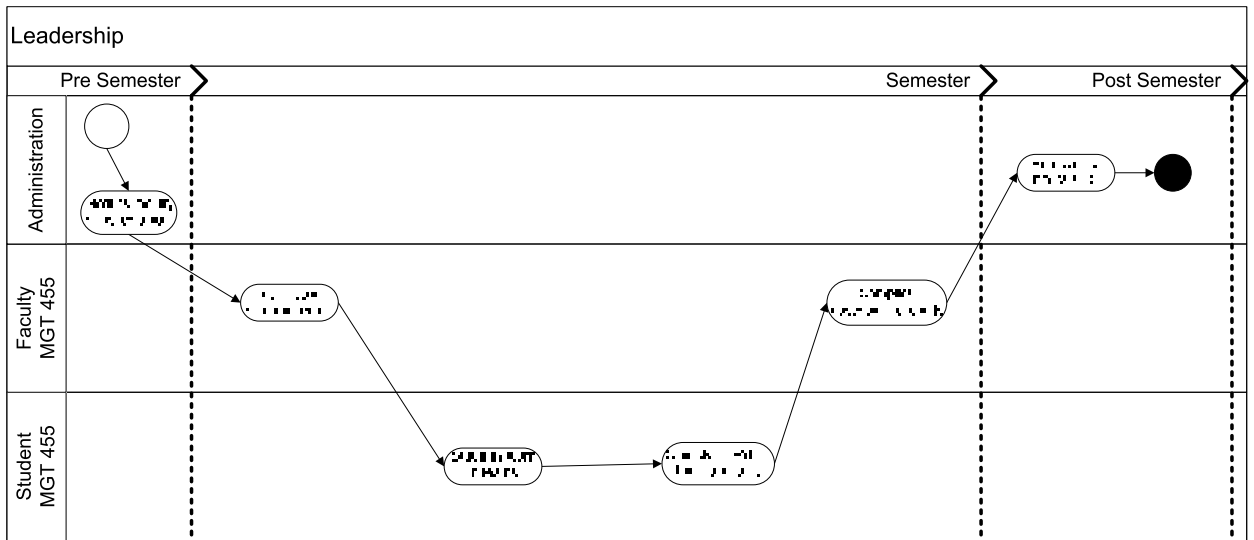
Oral Communication



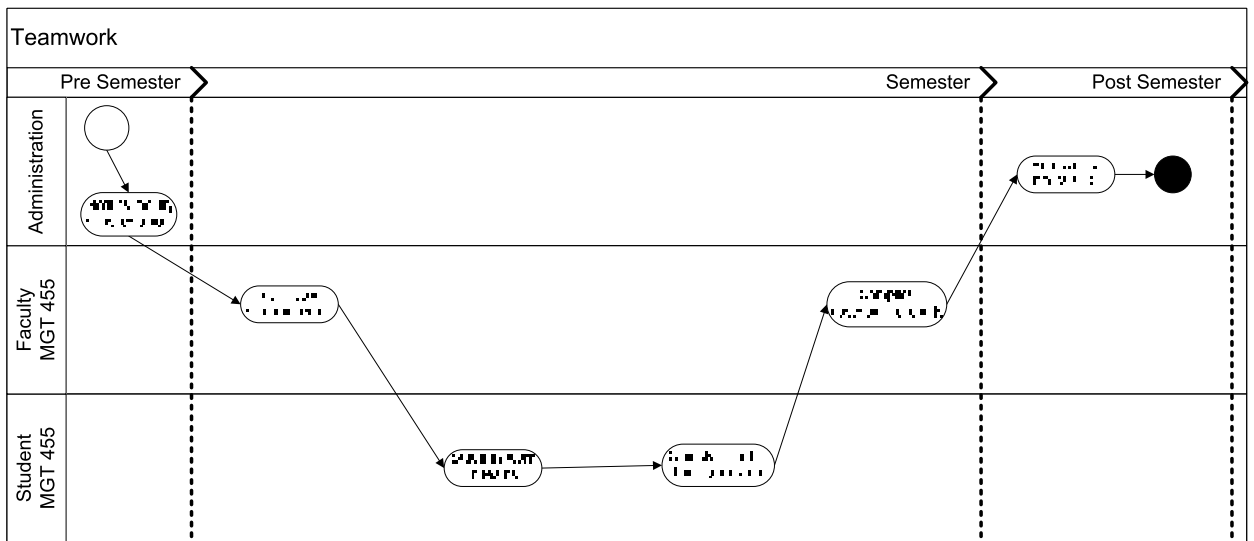
Integration



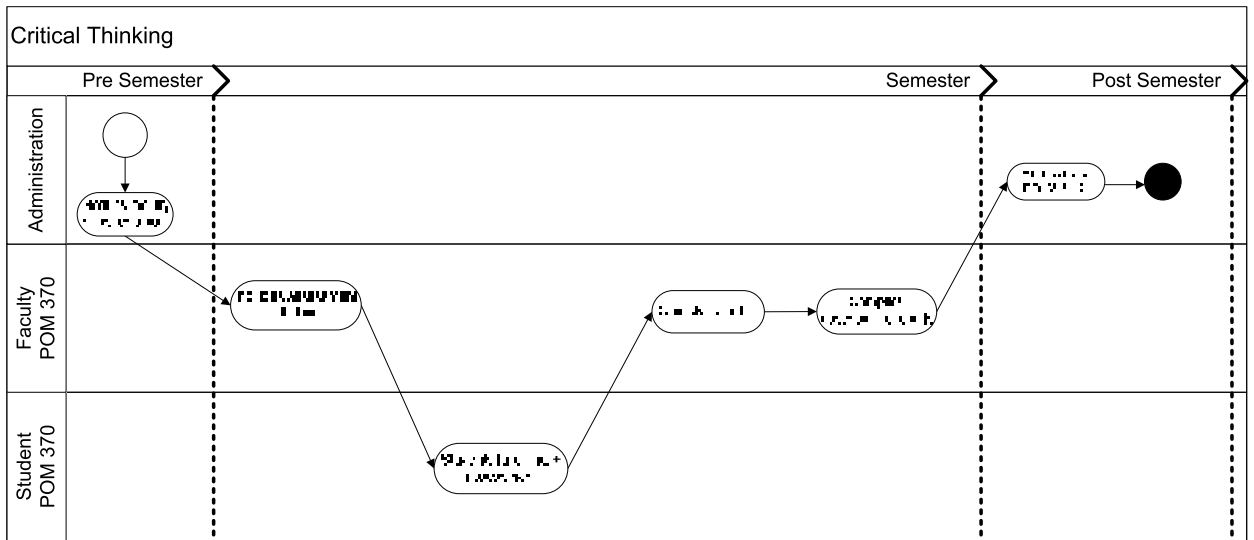
Leadership



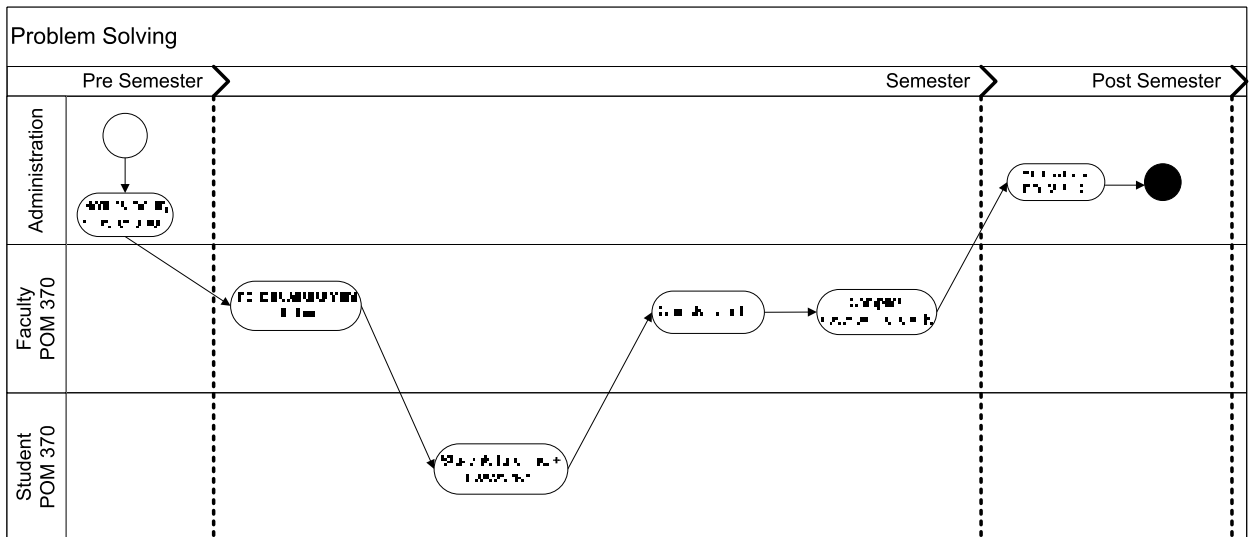
Teamwork



Critical Thinking



Problem Solving



APPENDIX H – Use Cases

Data Entry – Administrator

Use Case Name	Data Entry	
Scenario	AOL administration entering in outcome results into the AOL database.	
Triggering Event	The AOL administration receives outcome results from Leadership assessment after the faculty has administered the assessment.	
Brief Description	A faculty member has graded the Leadership assessment and gives the results to the AOL administration. The AOL administration logs into the AOL database, chooses the data entry option, and enters in the data.	
Actors	AOL Administration	
Related Use Cases	None	
Stakeholders	AOL Administration: to verify that the data content entered is correct AACSB: the annual report	
Preconditions	The Leadership learning goal must exist. A course has taken the assessment. The faculty member has graded the assessments. The AOL database exists.	
Post-conditions	The data must be associated with the correct learning goal. The AOL database must be updated.	
Flow of Events	Actor	System
	<ol style="list-style-type: none"> 1. Logs into the AOL database. 2. Clicks on the “Data Entry” button. 3. Clicks on the “Leadership” button. 4. Chooses the semester that corresponds with the data from the “Semester” drop down menu. 5. Chooses the major that corresponds with the course that took the assessment from the “Major” drop down menu. 6. Clicks on the radio button that corresponds with the appropriate score. 7. Clicks the “Save and Next button.” 8. Reiterates through steps 6 and 7 until the last outcome result. Here the AOL administrator clicks on the “Save” button. 9. Exits out of the AOL 	<ol style="list-style-type: none"> 1. Verifies login information is correct. 2. Redirects the actor to the data entry home page. 3. Redirects the actor to the Leadership entry page. 7. Inserts the data into the database. 8. Inserts the data into the database then redirects the actor to the data entry home page. 9. Exits.

	database.	
Exception Conditions	<ol style="list-style-type: none"> 1. If the actor uses wrong login information the system will display an error message and not let the actor login. 2. If the actor clicks the “Report” button he/she will be redirected to the Report home page. 3. If the actor clicks another learning goal’s button he/she will be redirected to the data entry page for that learning goal. 4. If the actor does not select a semester no semester information will inserted into the database. 5. If the actor does not select a major no major information will inserted into the database. 7. If the actor clicks the “Cancel” button the information will not be inserted into the database and the actor will be redirected to the data entry home page. 9. If the actor does not exit the AOL database he/she can enter in more data or generate reports. 	

Extract Transform Load – Administrator

Use Case Name	Extract Transform Load - Administration	
Scenario	AOL administration extracting outcome results from the ETS in the form of an Excel file.	
Triggering Event	The AOL administration needs to extract the outcome results from an ETS administered assessment, Written Communication.	
Brief Description	A group of students have taken the Content Knowledge assessment via an ETS. The administration log in to the ETS web site and export the data into an Excel file.	
Actors	AOL Administration, ETS	
Related Use Cases	Extract Transform Load – ETL	
Stakeholders	AOL Administration: to verify that the data content is exported correctly AACSB: the annual report ETS: to verify the correct assessments are administered and the correct data is exported	
Preconditions	The Written Communication learning goal must exist. A course has taken the assessment. The ETS has graded the assessments. The AOL database exists. The AOL administration has Microsoft Excel.	
Post-conditions	The data must be associated with the correct learning goal. The exported data must be saved.	
Flow of Events	Actor	System
	<ol style="list-style-type: none"> 1. The actor logs in to the ETS website. 2. Selects the “Cameron School of Business” link. 3. Selects the “Business Department” link. 4. Selects the desired class link. 5. Clicks on the “Export Report Data” link. 6. Exports the data into the AOL Export folder on the computer. 7. Exits out of the ETS web site. 	
Exception Conditions	<ol style="list-style-type: none"> 1. If the actor does not have permission to log in to the ETS web site then the data will not be exported. 4. If the actor does not choose the correct format for exporting the data, the data will not be inserted into the AOL database by the ETL. 7. If the actor exports the data to the wrong folder the ETL will be unable to locate the data. 8. If the actor does not exit out of the ETS web site he/she will be able to export more data. 	

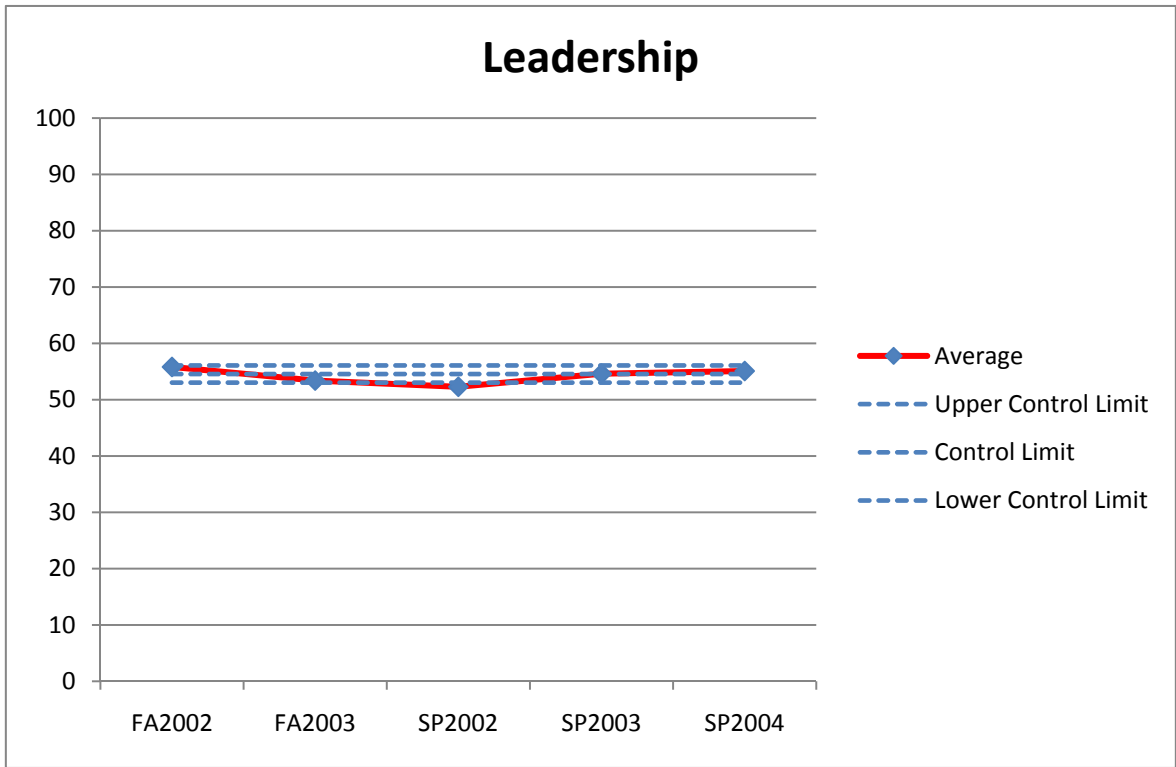
Extract Transform Load – ETS

Use Case Name	Extract Transform Load - ETL
Scenario	The AOL administration need to insert data exported from an ETS

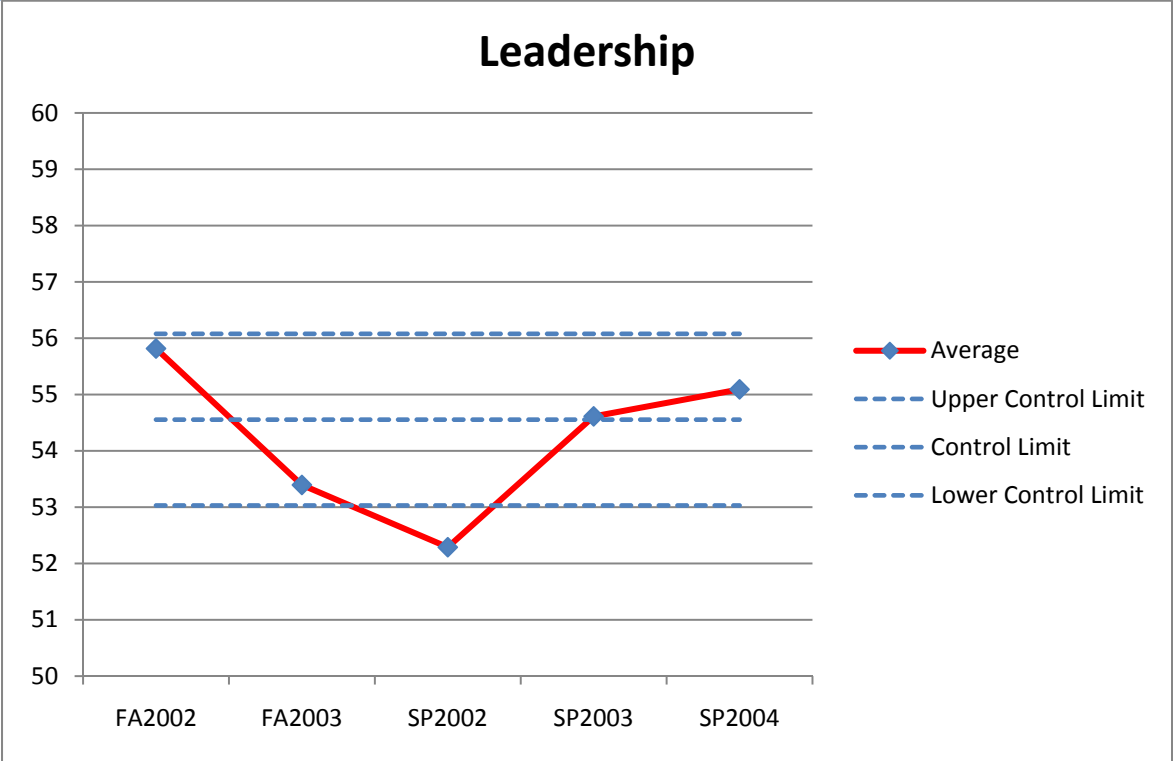
	into the AOL database.	
Triggering Event	The AOL administration has exported the outcome results for the Written Communication assessment and need to insert the data into the AOL database.	
Brief Description	The ETL locates the data in an Excel file, verifies that it is in the correct format to be inserted into the database, and inserts the data into the AOL database.	
Actors	ETL	
Related Use Cases	Extract Transform Load – Administration	
Stakeholders	AOL Administration: to verify that the data content is updated correctly AACSB: the annual report	
Preconditions	The Written communication learning goal must exist. A course has taken the assessment. The ETS has graded the assessments. The AOL database exists. The AOL administration has Microsoft Excel. The AOL administration has exported the outcome results.	
Post-conditions	The data must be associated with the correct learning goal. The AOL database must be updated.	
Flow of Events	Actor	System
	<ol style="list-style-type: none"> 1. The ETL package is executed. 2. The ETL opens the Excel file. 3. Copies the data in the file. 4. Transforms the data: selecting certain columns to load, filtering, etc. 5. Inserts the data into the AOL database. 	<ol style="list-style-type: none"> 1. Executes the package. 2. Opens the file. 3. Copies the data into a temp Excel file. 4. Manipulates the data. 5. Opens the AOL database, opens the corresponding table, and inserts the data into the table.
Exception Conditions	<ol style="list-style-type: none"> 1. If the package doesn't exist the file will not be inserted into the AOL database. 2. If the file doesn't exist an error message will occur. 5. If the database or table doesn't exist an error message will occur and the data will not be inserted into the table. 	

APPENDIX I – Prototype Charts

Mock up chart on a scale of 0 - 100



Mock up chart with scale adjusted



APPENDIX J – Survey Questions

Dr. Rebecca Porterfield

Please rate each statement from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

1. The project manager provided adequate communication throughout the project.
2. You fully understood the scope of the project.
3. The format of the chart templates are exactly what you asked for.
4. The project progressed in a timely fashion.
5. The productivity of project meetings was satisfactory.
6. You received ample user training.
7. Time it takes to create charts was greatly reduced.
8. Extract Transform Load makes data entry easier than before.
9. The standard format of outcome results is satisfactory.
10. Documentation created for the AOL program is very helpful.

Terrey Hatcher

Please rate each question from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

1. The project manager provided adequate communication throughout the project.
2. You fully understood the scope of the project.
3. The format of the chart templates are exactly what you asked for.
4. The project progressed in a timely fashion.
5. The productivity of project meetings was satisfactory.
6. You received ample user training.
7. Time it takes to create charts was greatly reduced.
8. Extract Transform Load makes data entry easier than before.
9. The standard format of outcome results is satisfactory.
10. The data entry screens are satisfactory.

Dr. Larry Clark

Please rate each question from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

1. Documentation created for the AOL program is very helpful.
2. The project and/or documentation meet AACSB requirements.

Dr. Douglas Kline

Please rate each question from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

1. The project manager provided adequate communication throughout the project.
2. You fully understood the scope of the project.
3. The format of the chart templates are exactly what you asked for.
4. The project progressed in a timely fashion.
5. The productivity of project meetings was satisfactory.
6. Time it takes to create charts was greatly reduced.
7. Extract Transform Load makes data entry easier than before.
8. The standard format of outcome results is satisfactory.
9. Documentation created for the AOL program is very helpful.
10. The data entry screens are satisfactory.

APPENDIX K – Survey Responses

Dr. Rebecca Porterfield (email of survey results)

Sent: Thursday, May 07, 2009 8:30 AM

To: [Peck, Sarah Elizabeth](#)

Sarah,

Here are my scores, will send hard copy later.

All are 10's except Q2...I am not sure that I actually totally understood what would be happening, also 6: Your documentation is excellent..I was not trained, Terrey was. Thank you so very much...your efforts have moved us light years forward. Becky

Terrey Hatcher

Terrey Hatcher

Please rate each question from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

1. The project manager provided adequate communication throughout the project.
10
2. You fully understood the scope of the project.
10
3. The format of the chart templates are exactly what you asked for.
10
4. The project progressed in a timely fashion.
10
5. The productivity of project meetings was satisfactory.
10
6. You received ample user training.
10
7. Time it takes to create charts was greatly reduced.
10 plus plus plus!
8. Extract Transform Load makes data entry easier than before.
10 plus plus plus!
9. The standard format of outcome results is satisfactory.
10
10. The data entry screens are satisfactory.
10

Sarah was so helpful and always willing to consider our needs and ways to standardize and automate procedures. Awesome job! Thanks so much!

Dr. Douglas Kline

Dr. Douglas Kline

Please rate each question from 1 to 10 (1 equating to dissatisfaction and 10 equating to extreme satisfaction) on how satisfied you are with the results.

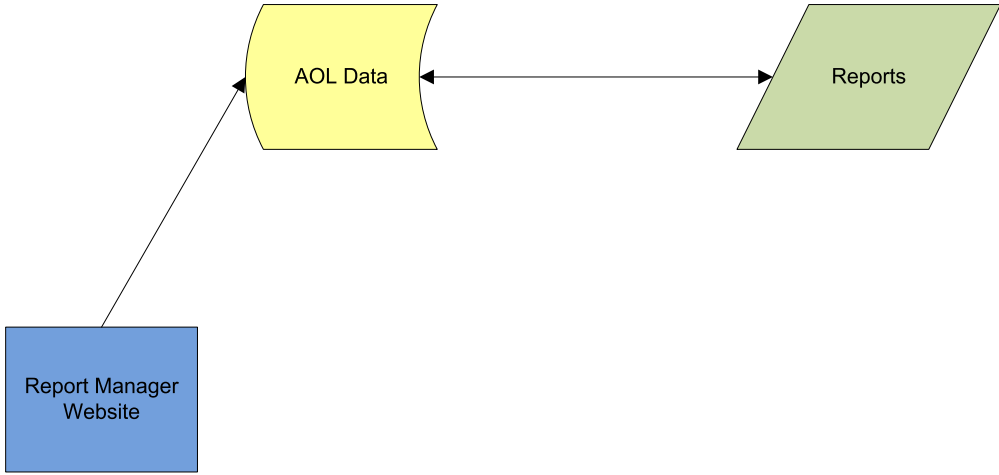
1. The project manager provided adequate communication throughout the project.
9 - one time where email sent rather than face-to-face meeting on potentially sensitive material
2. You fully understood the scope of the project.
10
3. The format of the chart templates are exactly what you asked for.
10
4. The project progressed in a timely fashion.
10
5. The productivity of project meetings was satisfactory.
10
6. Time it takes to create charts was greatly reduced.
10
7. Extract Transform Load makes data entry easier than before.
10
8. The standard format of outcome results is satisfactory.
10
9. Documentation created for the AOL program is very helpful.
10
10. The data entry screens are satisfactory.
10

APPENDIX L – System Architecture

Legend

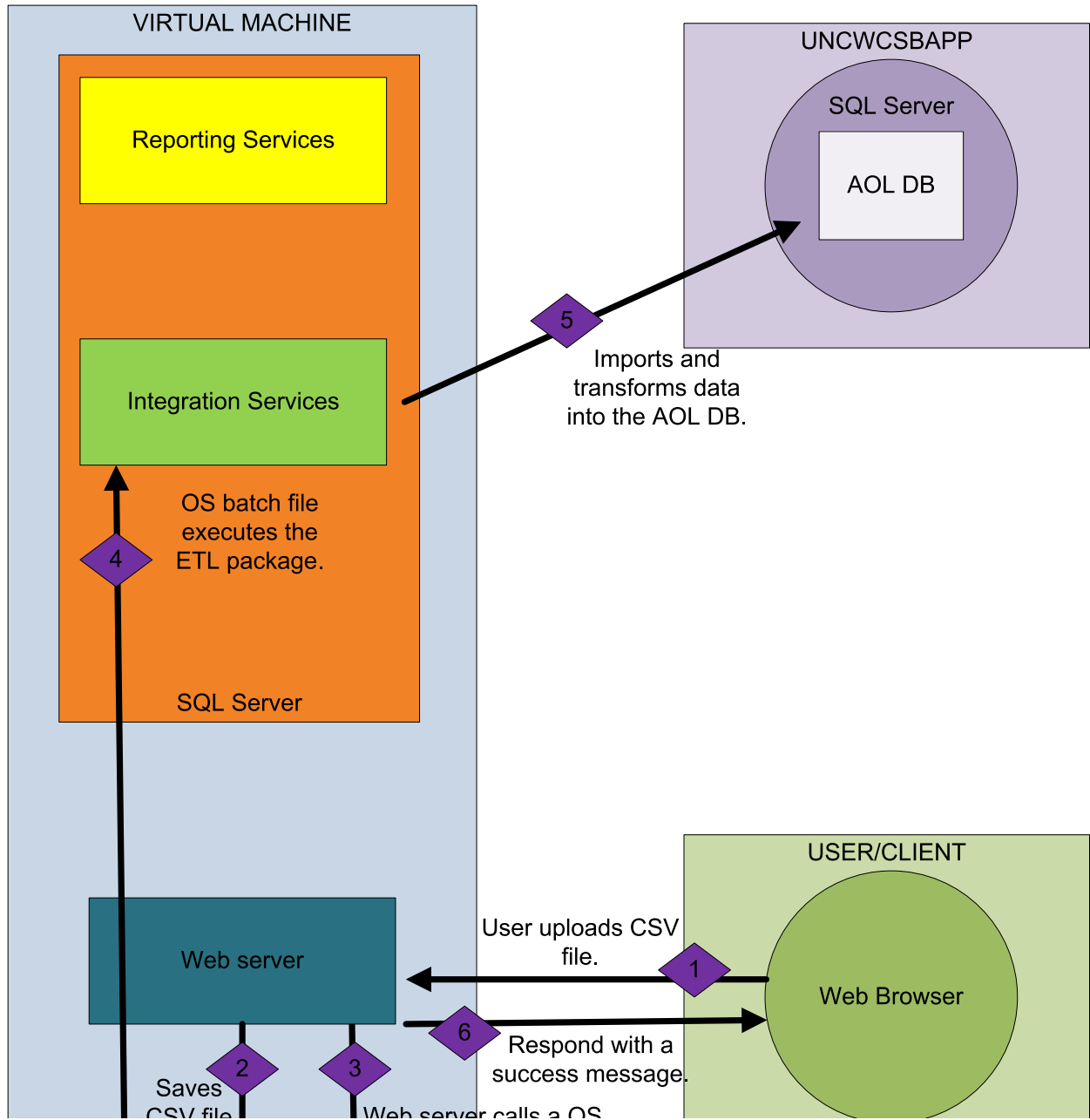


System Architecture Diagram

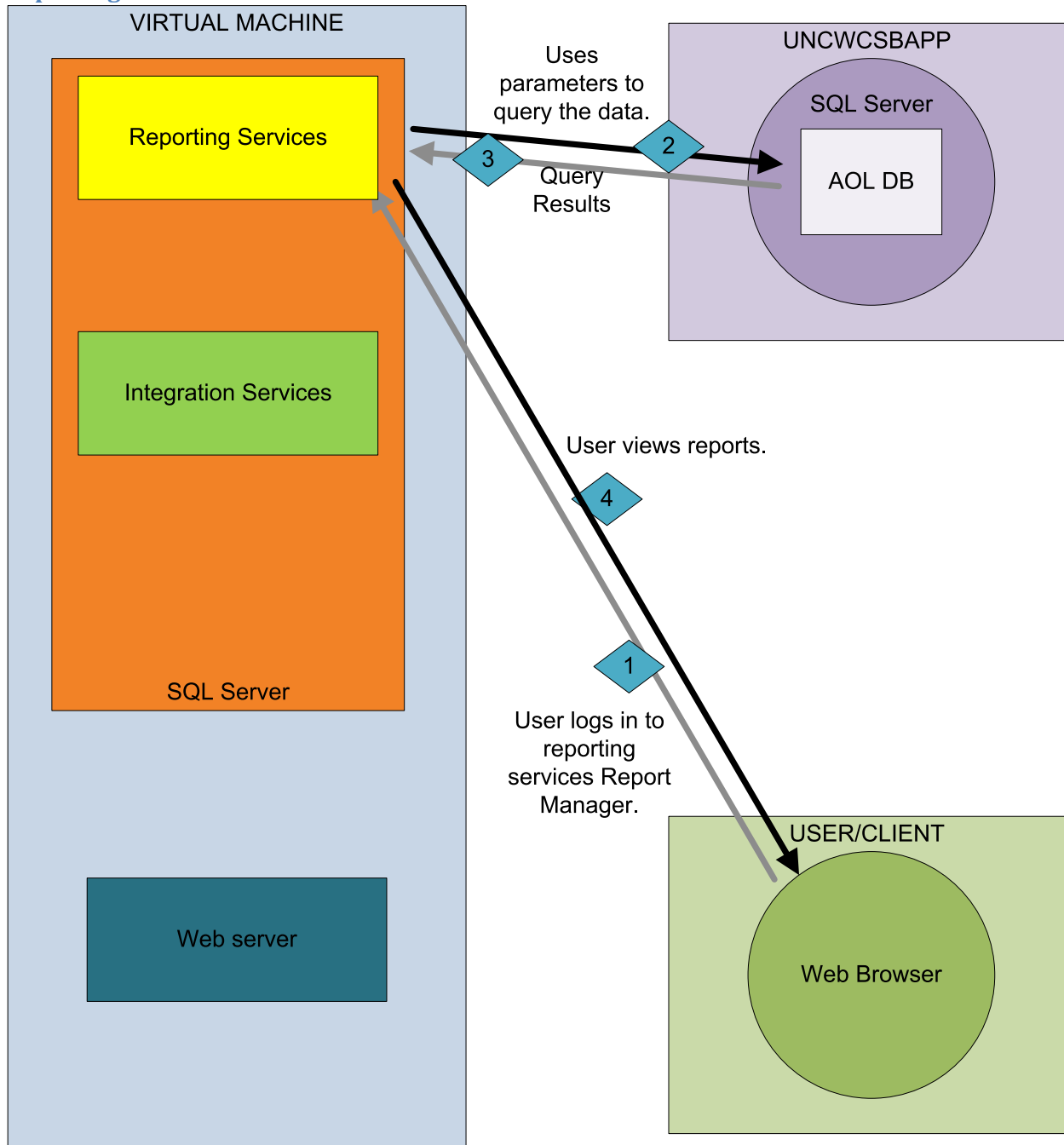


APPENDIX M – AOL Sequence/System Diagrams

ETL



Reporting



APPENDIX N – Data Entry Forms

Problem Solving

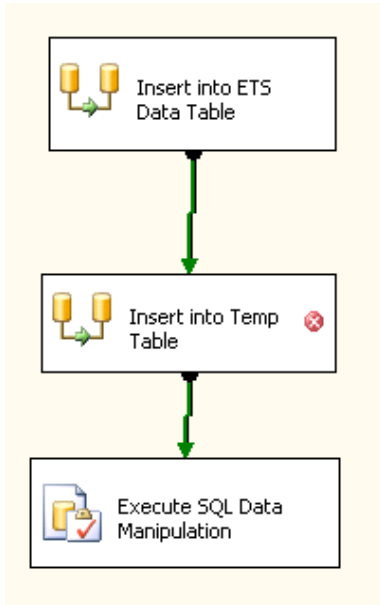
Problem Solving	Semester	<input type="text"/>	▼		
	Major	<input type="text"/>	▼		
		Exemplary	Acceptable	Unacceptable	NA
Defines and Understands the Problem:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Uses Information Appropriately:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Applies Appropriate Procedures:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Answers the Problem:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
<input type="button" value="Cancel"/> <input type="button" value="Save"/> <input type="button" value="Save and Next"/>					

Critical Thinking

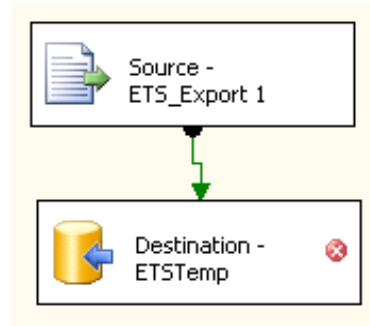
Critical Thinking	Semester	<input type="text"/>	▼		
	Major	<input type="text"/>	▼		
		Exemplary	Acceptable	Unacceptable	NA
Defines and Understands the Issue:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Considers Multiple Perspectives:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
Evaluates the Evidence:	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
<input type="button" value="Cancel"/> <input type="button" value="Save"/> <input type="button" value="Save and Next"/>					

APPENDIX O – Extract Transform Load

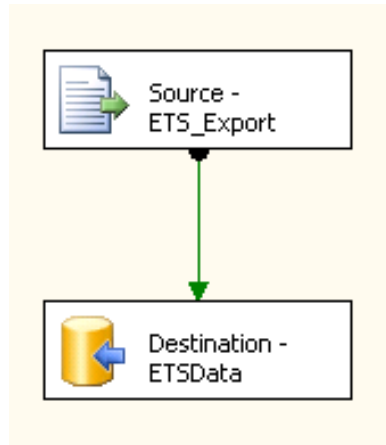
ETLImport Package



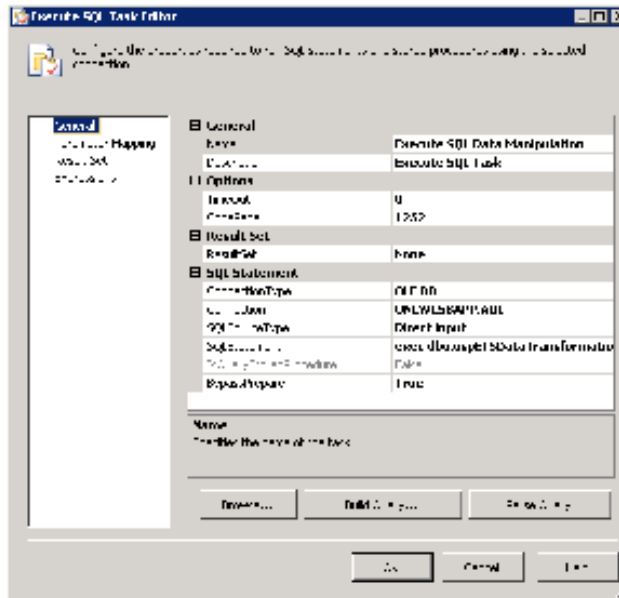
Insert into ETSTemp Data Work Flow



Insert into ETSTData Work Flow

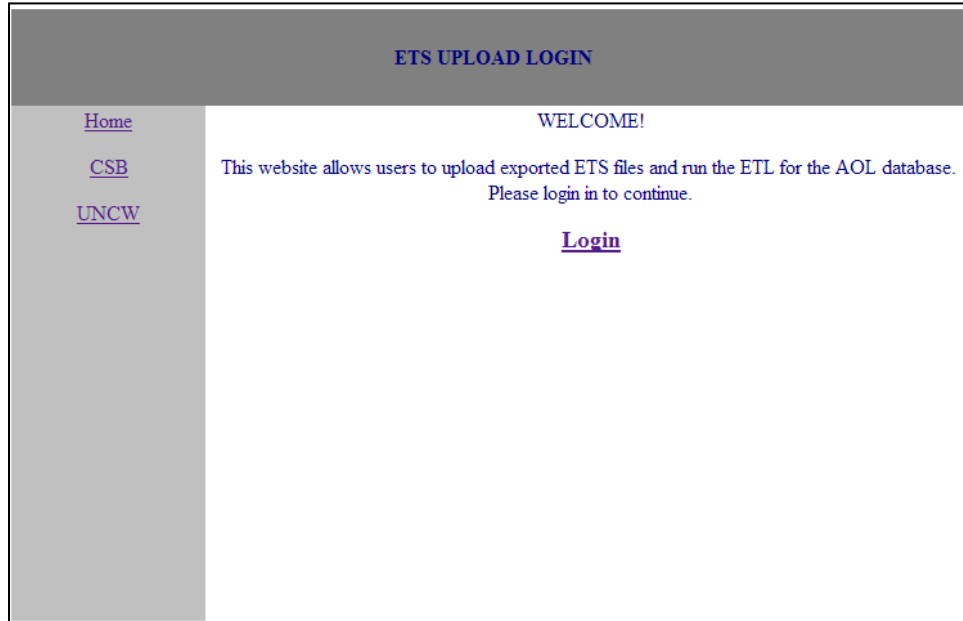


Execute SQL Stored Procedure



APPENDIX P – ETS Upload Website

Home Page



Home Code

Partial Class Home

Inherits System.Web.UI.Page

End Class

Login Page

ETS UPLOAD LOGIN

[Home](#) Enter Username and Password to login.

[CSB](#) User Name:

[UNCW](#) Password:

Login Code

Partial Class Login

Inherits System.Web.UI.Page

Protected Sub LoginButton_Click(ByVal sender As Object, ByVal e As System.EventArgs)

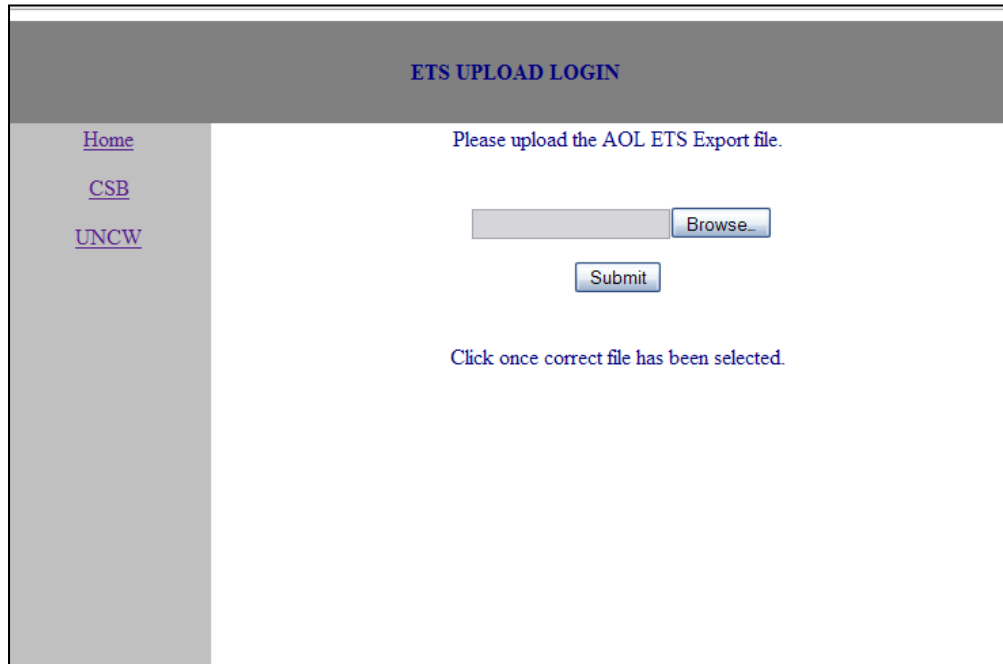
'Redirects the user to the upload screen if the login is successful

Response.Redirect("Upload.aspx")

End Sub

End Class

Upload Page



ETS UPLOAD LOGIN

[Home](#)

[CSB](#)

[UNCW](#)

Please upload the AOL ETS Export file.

Click once correct file has been selected.

Upload Code

Partial Class Upload

Inherits System.Web.UI.Page

Protected WithEvents Submit1 As System.Web.UI.HtmlControls.HtmlInputButton

Protected WithEvents File1 As System.Web.UI.HtmlControls.HtmlInputFile

Protected Sub UploadBtn_Click(ByVal sender As Object, ByVal e As System.EventArgs) Handles UploadBtn.Click

'Checks to see if a file has been selected for uploading

If FileUpload1.HasFile Then

If FileUpload1.PostedFile.ContentLength > 0 Then

'Save the file to the selected path

Dim path As String = "C:\...\..." & "\" & FileUpload1.FileName

FileUpload1.SaveAs(path)

'After the file is uploaded the user is redirected to the ETL execution page

Response.Redirect("~/ETL.aspx")

Else

Response.Write("Please select a file to be uploaded.")

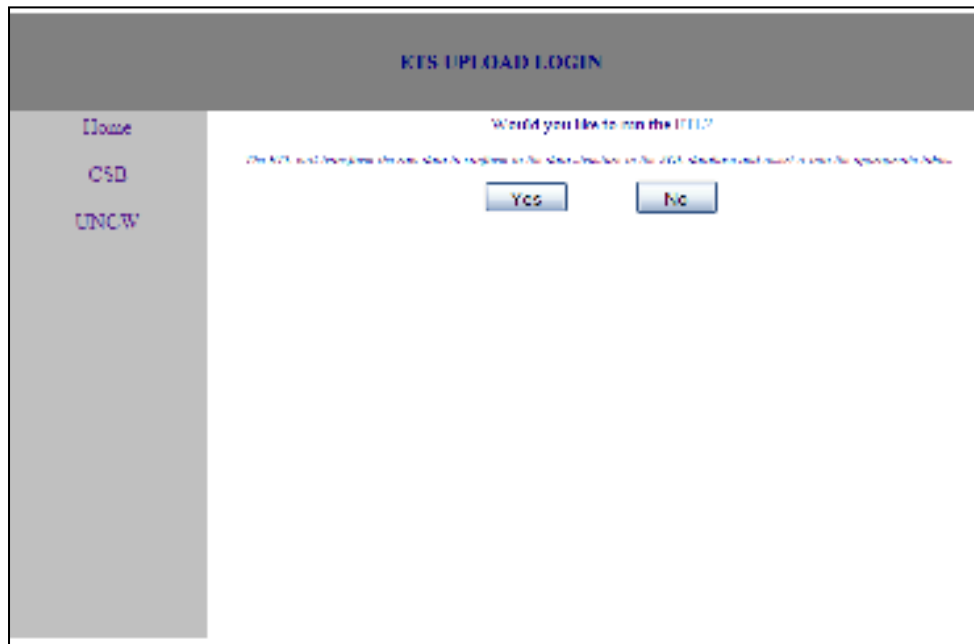
End If

End If

End Sub

End Class

ETL Page



ETL Code

```
Imports System.Data.SqlClient
Imports System
Imports System.Diagnostics
Imports System.ComponentModel
Partial Class ETI
    Inherits System.Web.UI.Page
    Protected Sub NoBtn_Click(ByVal sender As Object, ByVal e As System.EventArgs) Handles NoBtn.Click
        'When a user clicks on the No Button they are redirected to the home page
        Response.Redirect("~/Home.aspx")
    End Sub

    Protected Sub YesBtn_Click(ByVal sender As Object, ByVal e As System.EventArgs) Handles YesBtn.Click
        'When a user clicks on the Yes Button the ETLbatch file is executed

        System.Diagnostics.Process.Start("C:\...\..\")

        Response.Redirect("~/ETLConfirmation.aspx")

    End Sub
End Class
```

ETL Confirmation Page

ETS UPLOAD LOGIN

[Home](#)

[CSB](#)

[UNCW](#)

The ETL is complete. Would you like to upload another file?

Selecting YES will allow you to upload another file. Selecting NO will return you to the home page.

ETL Confirmation Code

```
Imports System.Data.SqlClient
Imports System
Imports System.Diagnostics
Imports System.ComponentModel
```

```
Partial Class ETI
```

```
    Inherits System.Web.UI.Page
```

```
    Protected Sub NoBtn_Click(ByVal sender As Object, ByVal e As System.EventArgs) Handles NoBtn.Click
```

```
        'When a user clicks on the No Button they are redirected to the home page
```

```
        Response.Redirect("~/Home.aspx")
```

```
    End Sub
```

```
    Protected Sub YesBtn_Click(ByVal sender As Object, ByVal e As System.EventArgs) Handles YesBtn.Click
```

```
        'When a user clicks on the Yes Button the ETLbatch file is executed
```

```
        System.Diagnostics.Process.Start("C:\...\...")
```

```
        Response.Redirect("~/ETLConfirmation.aspx")
```

```
    End Sub
```

```
End Class
```

APPENDIX Q – Structured Query Language Procedures

dbo.InsertCriticalThinking

```
USE [AOL]
GO
/***** Object: StoredProcedure [dbo].[uspInsertCriticalThinking]  Script Date: 04/30/2009 23:37:12 *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:                <Sarah Peck>
-- Create date:           <2/4/2009>
-- Description:           <Inserts a critical thinking entry into the response table>
-- =====
Create PROCEDURE [dbo].[uspInsertCriticalThinking]
    -- Add the parameters for the stored procedure here
    @majorID int,
    @semesterID int,
    @issue smallint,
    @perspectives smallint,
    @evaluate smallint
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    -- Insert statements for procedure here
    Declare @outcomeIDIssue int
    Declare @outcomeIDPerspectives int
    Declare @outcomeIDEvaluate int

    SET @outcomeIDIssue = 24
    SET @outcomeIDPerspectives = 25
    SET @outcomeIDEvaluate = 26

    Declare @respondentID int

    INSERT INTO dbo.Respondent
    (majorID, semesterID)
    VALUES (@majorID, @semesterID)

    Select @respondentID = @@IDENTITY
    if (@issue <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDIssue, @issue
    if (@perspectives <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDPerspectives, @perspectives
    if (@evaluate <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDEvaluate, @evaluate

END
```

dbo.InsertProblemSolving

```
USE [AOL]
GO
/***** Object: StoredProcedure [dbo].[uspInsertProblemSolving]  Script Date: 04/30/2009 23:38:12 *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:                <Sarah Peck>
-- Create date:           <2/4/2009>
-- Description:           <Inserts a problem solving entry into the response table>
-- =====
Create PROCEDURE [dbo].[uspInsertProblemSolving]
    -- Add the parameters for the stored procedure here
    @majorID int,
    @semesterID int,
    @problem smallint,
    @information smallint,
    @procedures smallint,
    @answer smallint
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;
    -- Insert statements for procedure here
    Declare @outcomeIDProblem int
    Declare @outcomeIDInformation int
    Declare @outcomeIDProcedures int
    Declare @outcomeIDAnswer int

    SET @outcomeIDProblem = 27
    SET @outcomeIDInformation = 28
    SET @outcomeIDProcedures = 29
    SET @outcomeIDAnswer = 30

    Declare @respondentID int

    INSERT INTO dbo.Respondent
    (majorID, semesterID)
    VALUES (@majorID, @semesterID)

    Select @respondentID = @@IDENTITY
    if (@problem <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDProblem, @problem
    if (@information <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDInformation, @information
    if (@procedures <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDProcedures, @procedures
    if (@answer <> -1)
    EXEC dbo.uspInsertResponse @respondentID, @outcomeIDAnswer, @answer
END
```

dbo.CreateETSTempTable

```
USE [AOL]
GO
/***** Object: StoredProcedure [dbo].[uspCreateETSTempTable]  Script Date: 04/30/2009 23:38:33 *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:          <Sarah Peck>
-- Create date:     <4/17/2009>
-- Description:     <Creates a temporary table for the ETS Data>
-- =====
Create PROCEDURE [dbo].[uspCreateETSTempTable]
    -- Add the parameters for the stored procedure here

AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    --**CREATE TEMP TABLE FOR DATA MANIPULATION
    Create Table ETSTemp
    (etsID int IDENTITY(1,1) PRIMARY KEY,
    Class varchar(50),
    ClassID varchar(50),
    LastName varchar(50),
    FirstName varchar(50),
    MiddleName varchar(50),
    RecentAssignmnet varchar(50),
    DateAndTime varchar(50),
    SubmissionNumber int,
    HolisticScore int,
    HolisticScoreMax int,
    Advisory varchar(200),
    Comments varchar(200))

END
```

dbo.ETSDataTransformation

```
USE [AOL]
GO
/***** Object: StoredProcedure [dbo].[uspETSDataTransformation]  Script Date: 04/30/2009 23:38:52 *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:                <Sarah Peck>
-- Create date:           <4/17/2009>
-- Description:           <Inserts the ETS data into the response and respondent tables>
-- =====
Create PROCEDURE [dbo].[uspETSDataTransformation]
    -- Add the parameters for the stored procedure here

AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

--**DECLARES VARIABLES
Declare @convertedDate datetime,
        @semester varchar(50),
        @major varchar(50),
        @year varchar(50),
        @semesterID int,
        @majorID int,
        @outcomeID int,
        @value int,
        @respondentID int

--**DATA MANIPULATION
Select @convertedDate = convert(datetime,substring(dbo.ETSTemp.DateAndTime,0,13)),
        @major = substring(dbo.ETSTemp.Class, 0,4)
From    dbo.ETSTemp

Set      @outcomeID = 23
Set      @year = year(@convertedDate)
Set      @semester = Case When month(@convertedDate) Between 8 and 12 Then 'FA'
                    When month(@convertedDate) Between 1 and 5 Then 'SP'
                    Else ''
                    end

Declare ETLCursor Cursor For

Select  dbo.Major.majorID, dbo.Semester.semesterID, dbo.ETSTemp.HolisticScore
From    dbo.ETSTemp, dbo.Major, dbo.Semester
Where   @major = dbo.Major.majorCode
        and
```

```
@semester = dbo.Semester.termCode  
and  
@year = dbo.Semester.year  
and  
not dbo.ETSTemp.HolisticScore is null
```

```
Open ETLCursor
```

```
While @@Fetch_Status = 0
```

```
Begin
```

```
FETCH NEXT FROM ETLCursor INTO @majorID, @semesterID, @value
```

```
--**INSERTS DATA INTO RESPONDENT TABLE
```

```
Insert into dbo.Respondent  
(majorID, semesterID)
```

```
Values
```

```
((@majorID,@semesterID)
```

```
--**RETRIEVES AUTOGENERATED RESPONDENT ID
```

```
Select @respondentID = @@IDENTITY
```

```
--**INSERTS DATA INTO THE RESPONSE TABLE
```

```
EXEC dbo.uspInsertResponse @respondentID, @outcomeID, @value
```

```
End
```

```
Close ETLCursor
```

```
Deallocate ETLCursor
```

```
----**CLEARS THE TEMPORARY TABLE
```

```
--Drop Table ETSTemp
```

```
Delete
```

```
From dbo.ETSTemp
```

```
END
```

dbo.RunETLBatch

```
USE [AOL]
GO
/***** Object: StoredProcedure [dbo].[uspRunETLBatch]  Script Date: 04/30/2009 23:39:15 *****/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
-- =====
-- Author:                <Sarah Peck>
-- Create date:           <4/29/2009>
-- Description:           <Calls the command line to run the ETL Batch file>
-- =====
Create PROCEDURE [dbo].[uspRunETLBatch]
    -- Add the parameters for the stored procedure here
    With execute as owner
AS
BEGIN
    -- SET NOCOUNT ON added to prevent extra result sets from
    -- interfering with SELECT statements.
    SET NOCOUNT ON;

    Exec master..xp_cmdshell 'ETLbatch'

END
```

APPENDIX R – Extract Transform Load Batch File

ETLbatch.bat

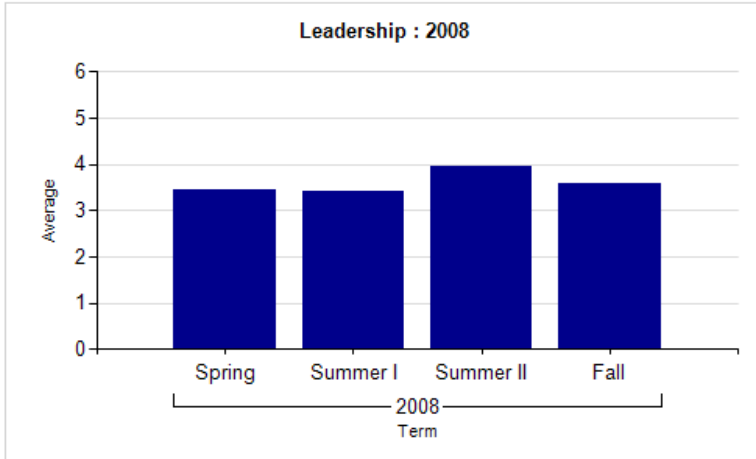
```
dtexec /F " C:\...\...\ETSIImport.dtsx"
```

APPENDIX S – Reports

Bar

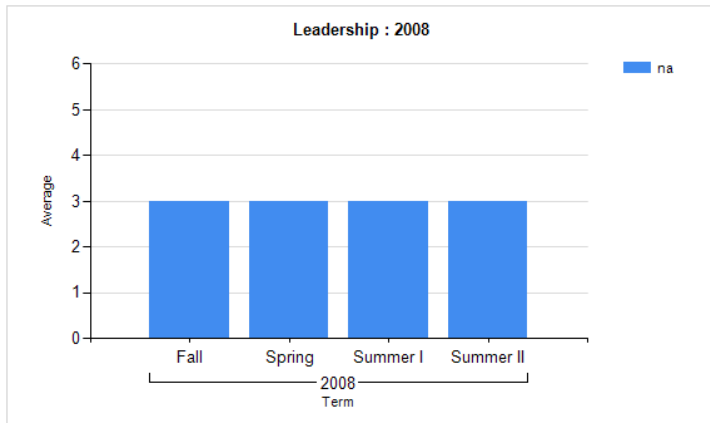
Learning Goal

Overall Learning Goal Results



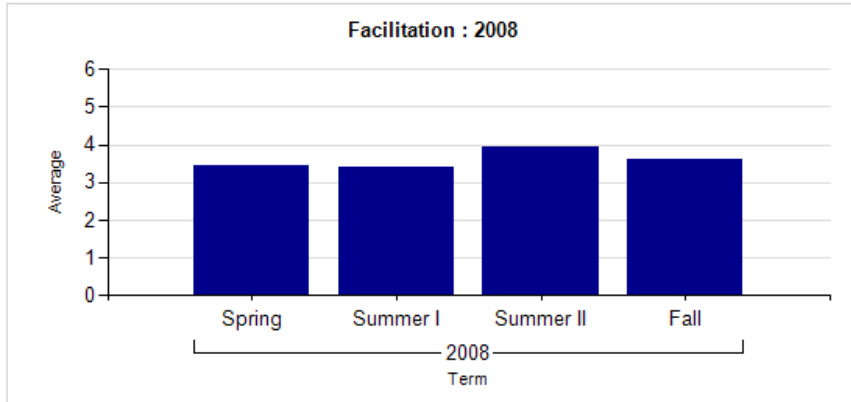
Learning Goal by Course

Learning Goal Outcome Results By Course



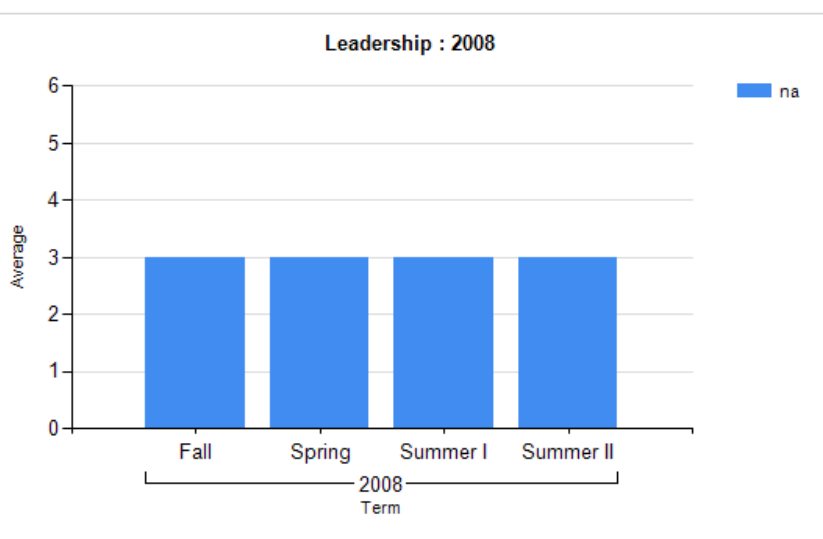
Outcome

Outcome Results For: Leadership



Outcome by Course

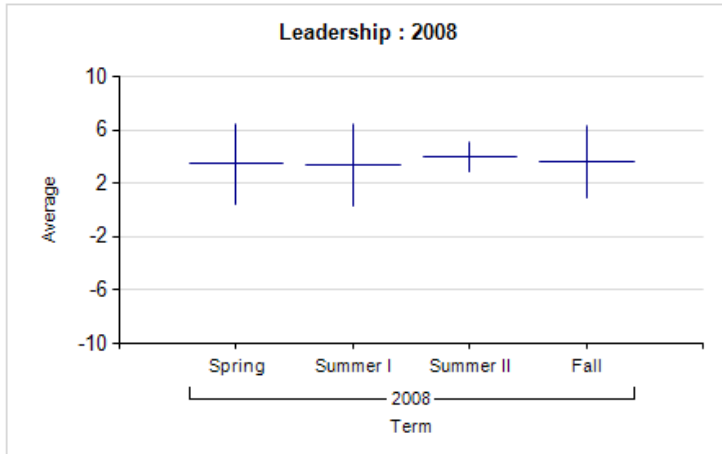
Outcome Results By Course



Range

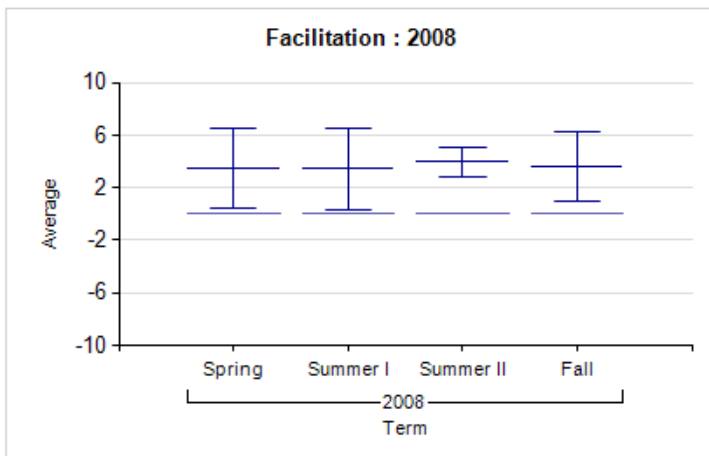
Learning Goal

Overall Learning Goal Results



Outcome

Outcome Results For: Leadership



Tabular

Learning Goal

Overall Learning Goal Results

Leadership : 2008

YEAR	TERM	AVERAGE
2008	Fall	3.59
	Spring	3.44
	Summer I	3.41
	Summer II	3.96

Learning Goal by Course

Overall Learning Goal Results

Leadership : 2008

YEAR	Term	Major	AVERAGE
2008	Fall	na	3
	Spring	na	3
	Summer I	na	3
	Summer II	na	3

Outcome

Outcome Results For: Leadership

Leadership : Facilitation : 2008

YEAR	TERM	AVERAGE
2008	Fall	3.59
	Spring	3.44
	Summer I	3.41
	Summer II	3.96

Outcome by Course

Overall Outcome Results

Leadership : Facilitation : 2008

YEAR	Term	Major	AVERAGE
2008	Fall	na	3
	Spring	na	3
	Summer I	na	3
	Summer II	na	3

EverythingReport

Year	Term	Learning Goal	Outcome	Average
2007				
	Summer II			
		Integration		
			Analysis of Issues	2.56
			Analysis Tools	2.50
			Functional Unit Integration	2.94
			Performance Outcomes	2.56
		Leadership		
			Facilitation	3.37
			Guidance	3.40
			Motivation	3.24
			Team Building	3.36
			Vision	3.33
		Oral Communication		
			Content	2.96
			Delivery	3.11
			Mechanics	2.22
			Organization	2.44
		Teamwork		
			Attendance	3.42
			Conflict Resolution	3.53
			Decision Making	3.29
			Goals	3.38
			Meetings	3.58
			Member Support	3.71
			Participation	3.54
			Roles	3.29
			Success	3.35
2008				