System and Software Architecture Description (SSAD)

Mission Science Information and Data Management System 2.0

Team number 2

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Version History

Date	Author	Version	Changes made	Rationale
10/14/12	RM	1.0	• Completed sections 1, 2.1.1-2.1.3	• For Core FC Package
10/22/12	RM	1.1	• Revised to use NDI Template	• For Draft FC Package
11/1/12	RM	1.2	• Resolved defects reported from IIV&V • Resolved defects reported from TA review	• Update for inter-document consistency
11/5/12	RM	2.0	• Added NDI interoperability section	• For DC package
11/14/12	RM	2.1	• Replaced references to “Administrator” with “Coordinator” for consistency, including System Context Diagram, Process Diagram, and System Structure Diagram.	• For IIV&V Review Feedback
12/5/12	RM	3.0	• Tables do not break over pages • Header and footer version correct throughout. • Replaced System Context Diagram with correction to remove Undergraduate Student. Matching update to corresponding table. • Replaced Artifacts Diagram with 2 separate diagrams for accuracy and clarity. • Corrected errors in use cases. • Corrections to writing style and grammar.	• Response to IIV&V • Feedback from TA

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1. Introduction

1.1 Purpose of the SSAD

The SSAD serves to document the architecture, and more specifically, the object-oriented analysis and design of the Mission Science 2.0 system. The SSAD is to be used by the builder in building the prescribed system. The system should remain faithful to the prescribed architecture of the SSAD, or the SSAD should be updated to match the latent architecture. The SSAD is used as reference by the maintainers once the system is delivered.

1.2 Status of the SSAD

The SSAD has also been revised to more accurately document the architecture of the system as more information has been discovered. The Artifact diagrams are much more accurate, and directly from the database system with two major views: Student and Project. Grammar has been revised. Use cases are clearer and more correct. General formatting is easier to read. The references to Administrator have been corrected to Coordinator for consistency.

2. System Analysis

2.1 System Analysis Overview

The primary aim of the Mission Science 2.0 Access Database is facilitate teaching STEM lessons to elementary children. This includes the management of lesson plans, inventory, and tracking the attendance. It also includes reporting on the associations between learning standards and student attendance. The reporting functionality can lead to increased funding opportunities which, in turn, can result in greater capability to teach STEM lessons to students.

2.1.1 System Context

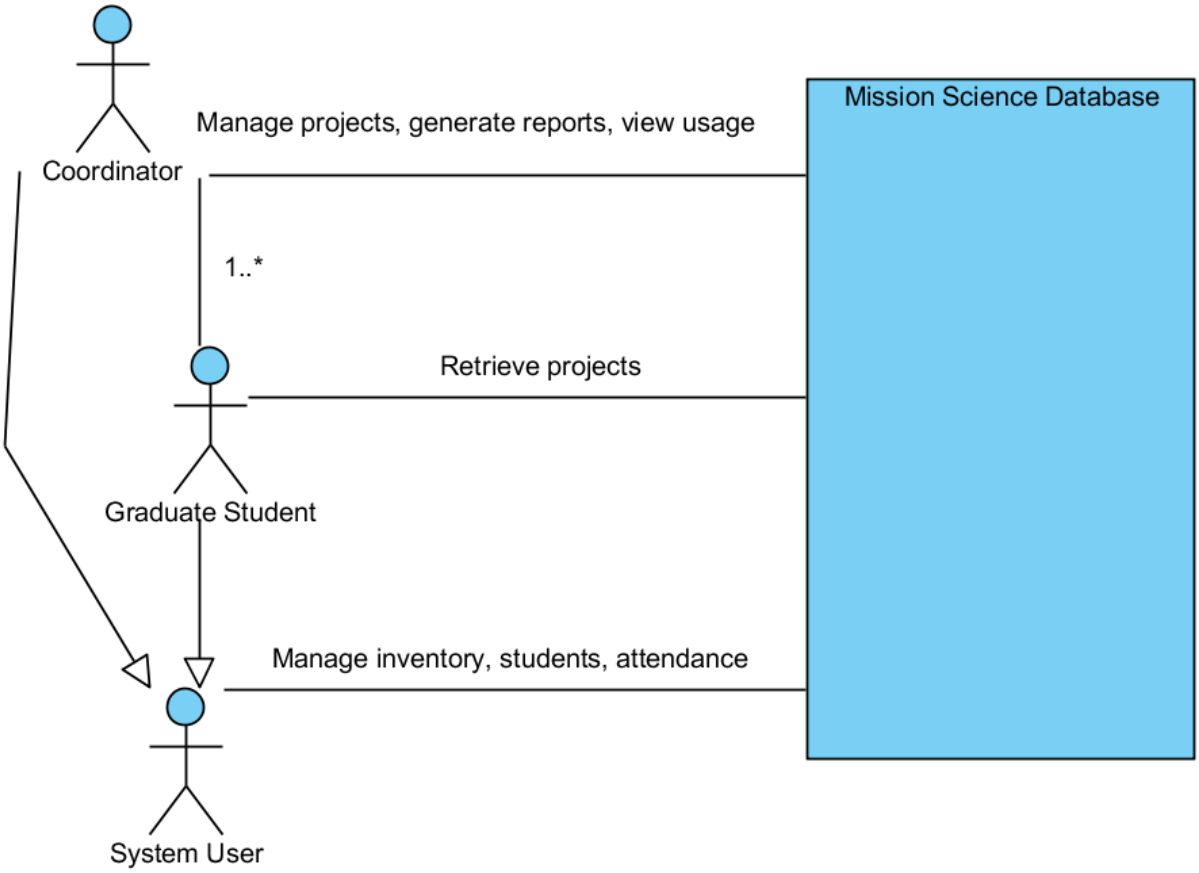


Figure 1: System Context Diagram

Table 1: Actors Summary

Actor	Description	Responsibilities
Coordinator	Manager of the database system and coordinator of Mission Science efforts	• Manage lesson plan data • Run reports for funding opportunities • Check logs of recent activity
Graduate Student	Viterbi/USC graduate student visits the various STEM school locations to teach the specified lesson plan(s).	• Execute lesson plans • Collect sign-in sheets for attendance
System User	Any user can maintain inventory and aid with data entry of sign-in sheets.	• Input sign-in sheets • Update student information • Update inventory in database

2.1.2 Artifacts & Information

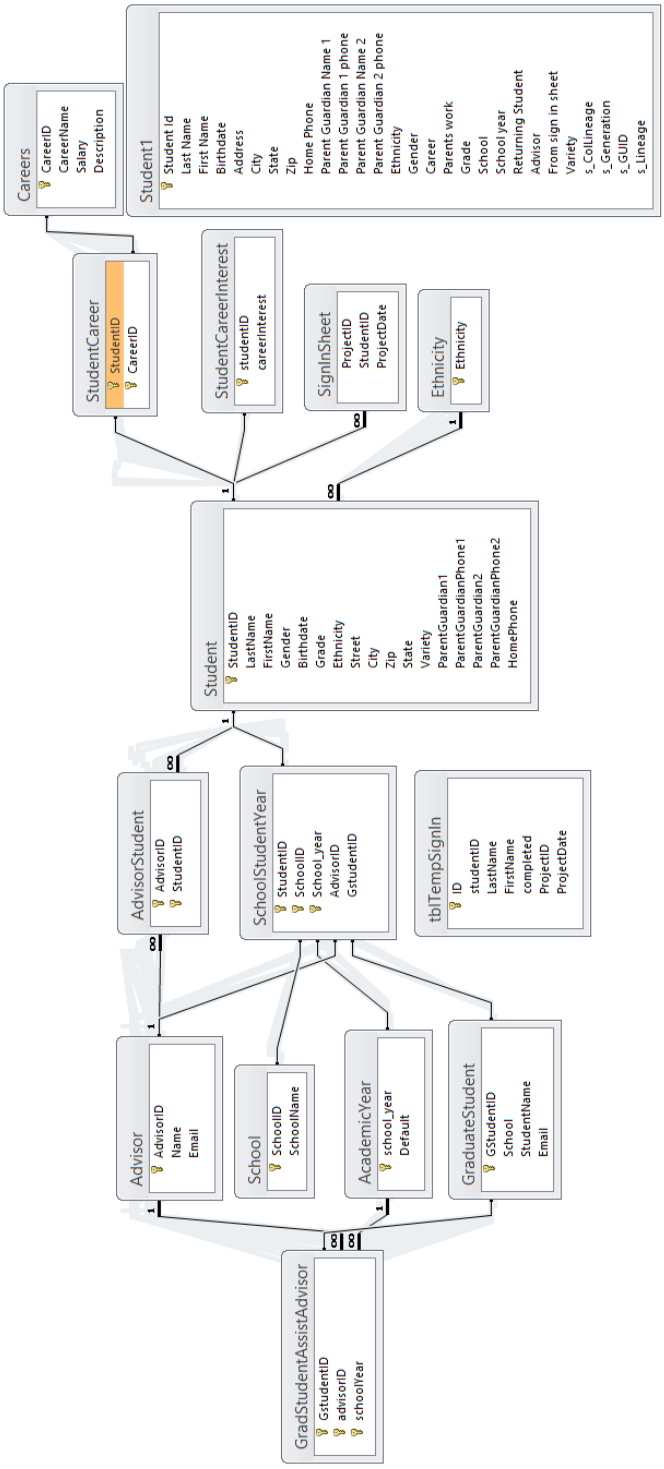


Figure 2: Artifacts and Information Diagram: Student Related

Table 2: Artifacts and Information Summary: Student Related

Artifact	Purpose
Student	The Student is the primary artifact, and is associated with the rest of the artifacts through secondary relationships.
Advisor	The advisor is the teacher at the school that is the contact point for Mission Science, to keep order during lessons.
School	The school is associated with the student, and can later be used to enhance reporting abilities.
Graduate Student	The Graduate student teaches the lessons at the school.
Academic Year	Students have information associated for each Academic Year.
Career	Career is used to track relationships between Students and Career options.
Sign-in Sheet	The Sign-in sheet is used to record attendance physically and later in the database, by recording the attendance of each student at a particular Project.

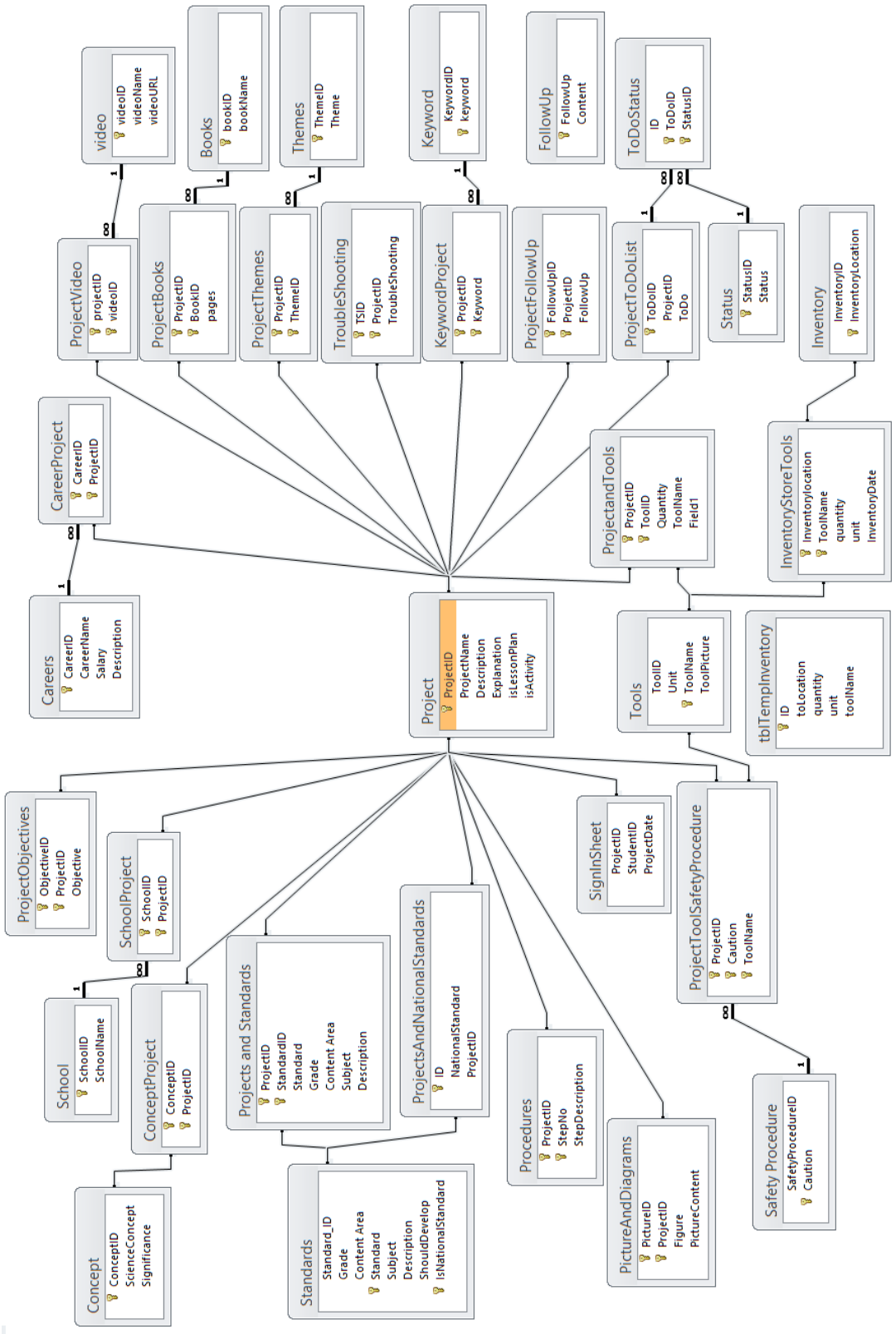


Figure 3: Artifacts and Information Diagram: Project Related

Table 3: Artifacts and Information Summary: Project Related

Artifact	Purpose
Project	Project is the primary artifact. It is associated with every other artifact in the diagram through primary and secondary relationships. A Project can be a Lesson Plan or Experiment
School	Projects are held at a school.
Objective	A Project can have a number of Objectives.
Career	A Project can be associated with a number of Careers.
Video	A Project can have informational Videos.
Book	Some Projects are simply references to content in a Book at the Center for Engineering Diversity (Mission Science).
Theme	A Project can have a number of Themes.
Troubleshooting	Troubleshooting is guidance for a Project in case there are problems.
Keyword	Enhancement to searching can allow for better Keyword searching.
Follow Up	Follow up steps to the Project.
Project To Do	To Do items associated with a Project.
Tools (Materials)	All possible tools and materials that are documented.
Inventory of Tools (Materials)	Inventory count (in various locations) of Tools and Materials.
Sign-in Sheet	Attendance of Students at a Project.
Safety Procedure	Certain Safety Procedures are associated with Tools and/or Materials.
Project Picture	Projects can have associated Pictures.
Procedure	The actual Procedure for a Project
Associated Standard	All Projects are aligned to Standards for reporting purposes, to show the value of the Mission Science program and Projects held at Schools.
Concept	Learning Concepts associated with a Project.

2.1.3 Behavior

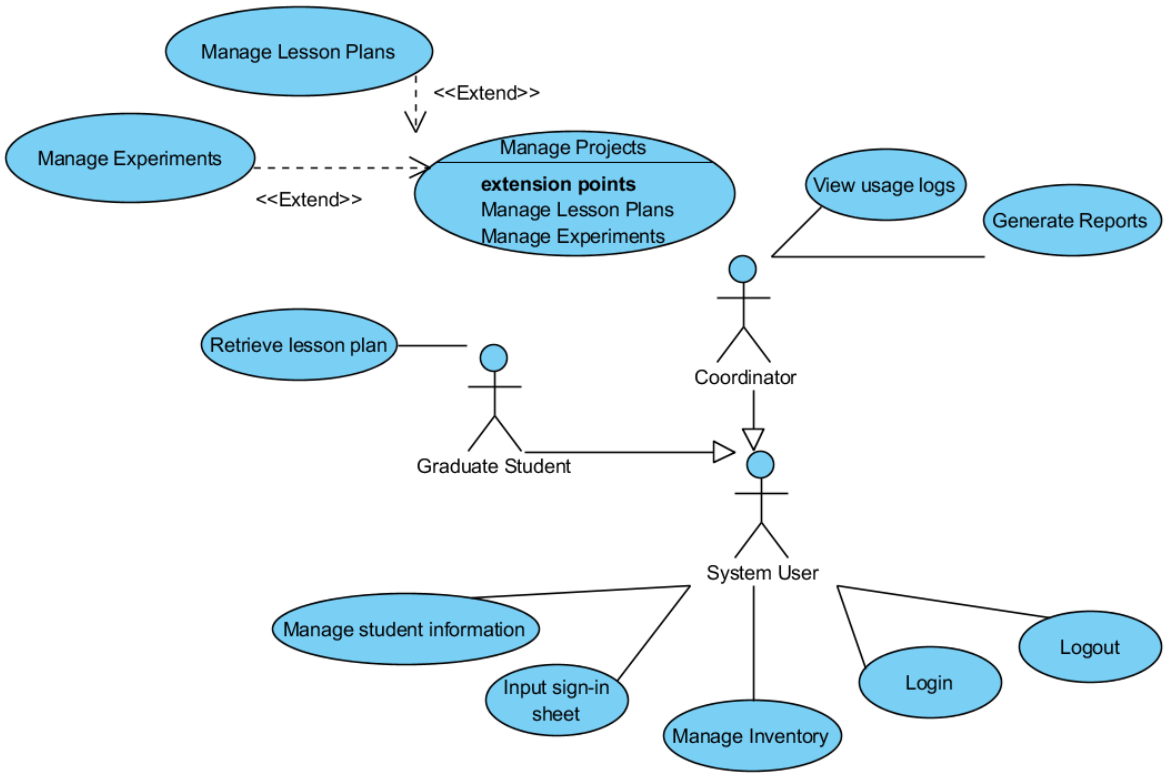


Figure 4: Process Diagram

2.1.3.1 System User Behaviors

2.1.3.1.1 Manage student information

Table 4: Process Description

Identifier	UC-1: Manage student information
Purpose	Add and update information about students that attend lessons
Requirements	The user has information about a student to enter in the database
Development Risks	Student information may be incomplete
Pre-conditions	A particular student is not already be in the database. The user is on the add student screen.
Post-conditions	The student will be recorded in the database.

Table 5: Typical Course of Action: No duplicate student

Seq#	Actor's Action	System's Response
1	Input details about a student	
2	Click save student	
3		Record the student in the database.
4		Show confirmation of the student is saved.

Table 6: Alternate Course of Action: similar or identical student prompts entry abort

Seq#	Actor's Action	System's Response
1	Input details about a student, and the First Name, Last Name, and Birthdate are already in another record.	
2	Click save student	
3		Show there is a similar student in the database, with the same First Name, Last Name, and Birthdate.
4		Prompt user to correct information (unique information) to be able to save the student information.

Table 7: Exceptional Course of Action: similar student exists, but not the same

Seq#	Actor's Action	System's Response
1	Input details about a student	
2	Click save student	
3		Show there is a similar student in the database.
4	Decide to save student information because it is a different student.	
		Show confirmation of the student is saved.

2.1.3.1.2 Input sign-in sheet

Table 8: Process Description

Identifier	UC-2: Input sign-in sheet
Purpose	Record the attendance for a particular lesson taught.
Requirements	The sign-in sheet from the lesson
Development Risks	Each student on the list should be in the database already.
Pre-conditions	All students have been entered into the database. User is on the "Input Sign-in Sheet" screen.
Post-conditions	Attendance for all students is recorded and associated with their profiles.

Table 9: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Input a student into a list	
2		Verify the student is found
…	Repeat for each student in attendance	
n	Click save attendance	
n+1		Show attendance has been saved

Table 10: Alternate Course of Action

Seq#	Actor's Action	System's Response
1	Input a student into a list	
2		Student is not found
3	Input student into database	
4	Input student into the list	
5		Verify student is found
…	Repeat for each student in attendance	
n	Click save attendance	
n+1		Show attendance has been saved

2.1.3.1.3 Manage inventory

Table 11: Process Description

Identifier	UC-3: Manage inventory
Purpose	Keep database of physical inventory up to date to reference for lesson plan requirements
Requirements	Accurate current physical count of inventory
Development Risks	
Pre-conditions	User is on the “Manage Inventory” screen.
Post-conditions	The item will show the accurate count on hand.

Table 12: Typical Course of Action

Seq#	Actor’s Action	System’s Response
1	Search for inventory item by name	
2		Show inventory items that match
3	Choose inventory item	
4		Show information about item
5	Change inventory quantity	
6	Click save	
7		Show confirmation

Table 13: Alternate Course of Action

Seq#	Actor’s Action	System’s Response
1	Search for inventory item by name	
2		No items returned
3	Click add	
4		Show blank page of inventory about new item
5	Input all information and quantity	
6	Click save	
7		Show confirmation

2.1.3.2 Graduate Student Behaviors

2.1.3.2.1 Retrieve lesson plan

Table 14: Process Description

Identifier	UC-4: Retrieve lesson plan
Purpose	Graduate students should be able to view and print lesson plans to alleviate pressure on the administrator
Requirements	Lesson plans are input into system
Development Risks	
Pre-conditions	There is at least one lesson plan in the system
Post-conditions	The user will be viewing the lesson plan

Table 15: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Search for lesson plan by subject, science standard, title, or keyword	
2		Show list of matching lesson plans
3	Click on a particular lesson plan	
4		Show lesson plan details

Table 16: Alternate Course of Action: no matching lesson plan

Seq#	Actor's Action	System's Response
1	Search for lesson plan by subject, science standard, title, or keyword	
2		Show no lesson plans match

2.1.3.3 Administrator Behaviors

2.1.3.3.1 Manage projects

Table 17: Process Description

Identifier	UC-5: Manage projects
Purpose	Create new or edit existing projects
Requirements	Have the details about a project
Development Risks	
Pre-conditions	Administrator has details for the project to be entered
Post-conditions	The project is recorded in the database

Table 18: Typical Course of Action: add new project

Seq#	Actor's Action	System's Response
1	Click create new project	
2		Show empty entry form for project
3	Input entry form details	
4	Click save	
5		Show confirmation of save

Table 19: Alternate Course of Action: find a project to edit

Seq#	Actor's Action	System's Response
1	Search for project by subject, science standard, title, or keyword	
2		Show list of matching project
3	Click on a particular lesson plan	
4		Show project details
5	Edit project details	
6	Click save	
7		Show confirmation of save

2.1.3.3.2 View usage logs

Table 20: Process Description

Identifier	View usage logs
Purpose	View brief information on what area of the database has had recent activity
Requirements	Administrator needs to view usage of the system
Development Risks	Requires ability to login and record activities as they occur
Pre-conditions	Recent activity has been logged
Post-conditions	Recent activity is displayed

Table 21: Typical Course of Action

Seq#	Actor's Action	System's Response
1	Navigate to recent activity logs area	
2		Show recent activity logs

2.1.3.3.3 Generate reports

Table 22: Process Description

Identifier	UC-6: Generate reports
Purpose	Generate reports for longitudinal studies; generate reports to provide to teachers or principals to show the science standards covered; generate reports to show students that have attended but are not in the database as proper students
Requirements	Administrator has a specified data requirement to fill with a generated report.
Development Risks	Minimal: Access offers built-in reporting.
Pre-conditions	At least one report type has been saved
Post-conditions	The report desired will be viewed

Table 23: Typical Course of Action: Generate Saved Report

Seq#	Actor's Action	System's Response
1	Navigate to reports area	
2	Choose a report to view	
3		Show desired report

Table 24: Alternate Course of Action: Generate New Report

Seq#	Actor's Action	System's Response
1	Navigate to reports area	
2	Create new report, using built-in Access functionality to choose display fields, formatting, and data options.	
3		Display report as configured.

3. NDI/NCS Interoperability Analysis

3.1 Introduction

The sole NDI our project is using is Microsoft Access, with versions 2007 and 2010.

3.1.1 COTS / GOTS / ROTS / Open Source / NCS

Table 25: NDI Products Listing

NDI/NCS Products	Purposes
Microsoft Access 2007	Database access
Microsoft Access 2010	Database access

3.1.2 Connectors

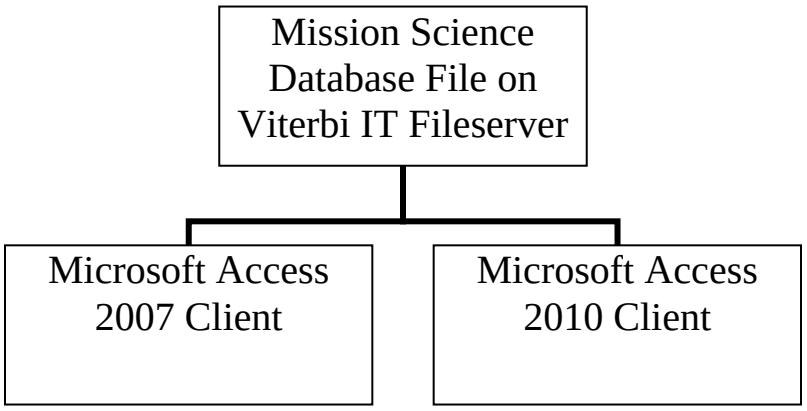
In this project, both Microsoft Access 2007 and Microsoft Access 2010 will be using a Microsoft Access database.

3.1.3 Legacy System

The current system is an Access 2003 file located on a fileserver network share. It is in use by clients with Access 2007 and Access 2010. Due to constraints by Viterbi IT, it cannot currently be migrated from the Access platform.

The legacy system has considerable technical debt from lack of accurate documentation, and gradual undocumented changes to the system. It also displays some Access anti-patterns in development of forms and tables: manually binding in VBA rather than using simple, more manageable functions.

3.2 System Structure



3.3 Evaluation Summary

Table 26: NDI Evaluation

NDI	Usages	Comments
Microsoft Access 2007	Database access	Older version, but still very compatible with many of the new features of Access 2010. Less preferred option, but provides ability to upgrade legacy components that were designed for Access 2003.
Microsoft Access 2010	Database access	More feature available, but constrained by keeping compatibility with Access 2007. Much more preferred option due to better functionality.