CS486C – Senior Capstone Design in Computer Science
Project Description

Project Title:	CPCESU Project Management System

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Introduction:

The Colorado Plateau Cooperative Ecosystems Studies Unit (CPCESU) is part of the National CESU Network, which is a national consortium of federal agencies, tribes, academic institutions, state and local governments, nongovernmental conservation organizations, and other partners working together to support informed public trust resource stewardship. The Colorado Plateau CESU (CPCESU) is the subdivision of the CESU network responsible for the southwestern states and is comprised of 10 federal agencies and 33 nonfederal partners, including universities, colleges, and non-profit organizations; Northern Arizona University serves as the host institution for the CPCESU.

The overall goal of the CPCESU is to promote partnerships between outside experts (e.g. NAU faculty researchers) and partners in federal management agencies to create innovative opportunities for research, technical assistance, and education to support the management of natural and cultural resources on federal lands. The CPCESU was established in 1999 and to date has facilitated over 2000 projects in excess of $125 million, many of which provide students with real-world experience in science and resource management.

Problem Overview

The CPCESU carries out hundreds of projects each year with our partners; each project is established through the development of "task agreements", which are essentially work proposals that clearly detail project-specific information such as a unique identifying number, partners, title, period of performance, personnel, funding amounts, project descriptions, and subsequent modifications. The information in these documents constitute the data that NAU and our partners require to manage, track, and report on these projects.

We are currently storing 20 years of sponsored projects data in a Microsoft Access database. This legacy database was developed over many years by various individuals with varying degrees of technical

expertise, resulting in a rather ad hoc system with little documentation. In particular, it fails to implement standard conventions in database design, such as using a primary key, tables with determinate relationships, fields that conform naming conventions, adequate formatting and validation rules, data QA/QC, and user permissions. Accordingly, there are currently significant limitations in our ability to enter, query, and report on quality data within a relational environment.

Envisioned Solution

What is needed is a professionally-quality proposal management system that provides both existing and missing features, is primed with all proposals in the existing database, and that supports efficient processing of future proposals.

Specifically, this project is based around the creation of a secure, sophisticated web-application that supports various secure methods of access to existing task agreements, as well as streamlined and processing of new proposals. Some key requirements for the proposed project include:

- Must be based on modern Web2.0 frameworks and an industry standard opensource database backend (e.g. Postgres). Will require analysis and redesign of existing database schemas to eliminate un-used fields, add fields/tables to support new functions, and generally streamline operation.
- Must include secure user management with strong permissions structure to control access to task agreements in various stages of development (e.g., submitted, in-progress, and completed).
- Must support entire workflow of task agreement development, starting with a submitted proposal and moving through revisions and acceptance. Must further support task agreement management through the project lifecycle, e.g., project extensions and modifications.
- Must provide secure, well-designed GUIs for CESU staff, including "dashboard" views for easy overviews of database contents, status, and pending tasks for the logged in user. Should provide some support for workflow management, e.g., assigning tasks to registered users, notifying/reminding users of pending tasks, etc.
- The system should be designed to support any number of CESU site, of which CPCESU is just one. That is, the system must allow the system administrator to create a new, blank site for some CESU region (e.g. CPCESU), designate a registered user as site admin for that new site. The new site admin can then create users and manage CESU activities for that site. In this way, we will be creating a system to serve the needs of CPCESU…but can also very simply host task agreement management for other CESU divisions across the country.
- The web-application must integrate well with our existing CESU websites, allowing easy integration, for example, of pages that allow searching for and viewing task agreements by staff and outside stakeholders.
- The web application should be hardware agnostic, i.e., should be able to be installed either on traditional physical server, or on cloud-based virtual machines.

By designing the system to serve not only CPCESU, but all CESU sites, the resulting product can help modernize the entire CESU network. At very least, this system will create a modern, professionally-designed architecture to support the mission of the CPCESU for the next decade or more.

Knowledge, skills, and expertise the will be needed for this project:

- Modern 2.0 Webapp development, including exploration of various web2.0 frameworks, web services, etc.
- Database skills: Team members will need to have/become knowledgeable in best practices for database design and management.

- Expertise in cloud infrastructures. The team will be expected to explore the pros/cons of hosting the portal described here in the cloud, e.g., on Amazon Web Services.
- Software development skills: Team members should be knowledgeable in various software development environments and programming languages appropriate for deploying or creating software to extract and upload data and serve it via the internet.

Equipment Requirements:

- No special equipment should be required beyond a standard development platform, as well as freely available environments and software tools.

Software and other Deliverables:

- The software applications as described above, deployed and tested successfully with real data. Must include a complete and clear User Manual for configuring and operating the software.
- A strong as-built report detailing the design and implementation of the product in a complete, clear and professional manner. This document should provide a strong basis for future development of the product.
- Complete professionally-documented codebase, delivered both as a repository in GitHub, BitBucket, or some other version control repository; and as a physical archive on a USB drive.