Senior Project Final Report

Department of Computer Science

Calvin University

Title: Affordable Care Act System
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Mentor: Prof. Patrick Bailey
Honors Project: No
Project Website: ACA Processing System

Vision and General Overview

Background and Problem

The Affordable Care Act (ACA) requires employers with 50 or more employees to provide employee health insurance and includes tax insurance that affects individuals, businesses, organizations and government entities. Tax provision will demonstrate important changes of their provision and it includes how each individual files their taxes. This act includes premium taxes and cost-sharing reductions to lower expenses. Part of this includes completion of forms 1094C and 1095C, and for employers with more than 200 employees an XML based report must also be submitted. By submitting both forms, employees will be able to review their submitted forms and make a decision whether it will be accepted or not.

Brief Description of Solution Being Provided

This project will aim towards

1. Developing a database repository that can maintain ACA information for a single organization

2. A front end with CRUD support

3. Publication that required PDF forms for 1094C and 1095C

4. Publication of XML files to support electronic submission of 1094C and 1095C information

5. An automated quality control mechanism to confirm adherence to the required XML Schema

- 2021:
  - Since two members of the project left, Professor Bailey came up with a new solution for this project.
    i. Construct and XML submission for the 1094/5 information
    ii. Create the manifest portion
  - These solutions will give us the advantage to work on making the XML manifest of both forms (1094/5C) which will guide us to the part where we submit the information given with the database implemented for this and show the results in a file. By running tests of both forms, we will be able to analyze the data, see if the database contains the information saved, and if the file shows all specific information given. By the time we have the demo, we will show a portion of the manifest.
  - To accomplish these goals, we will use PHP, the database will be a Microsoft SQL Server database, WampServer (Apache) to run the PHP file, and HTML for the form.

Your Interest and Qualifications

Our team wanted to develop a processing system that manages the PDF and XML publications to support the Affordable Care Act. All the members in our team are taking CS-342, so we're confident that we'll be able to learn the necessary skills needed in creating a database system.

Marcos: I am interested in Web Development, Game Development, and Software Engineering. I have done projects with Python and Java; but I don't have much experience with XML files/documents, this is my first time to ever read and work with XML. To implement an XML file will take time but with guidance from our mentor, Professor Bailey, we will be able to understand how it works. I took a Database class, CS-342, which explained the fundamentals of a database management system, how to use clauses for a table in Microsoft SQL Management Studio. CS-342 will be a helpful guide for our project since we are required to create a database for the 1094C and 1095C forms from ACA IRS. Having this experience I believe I will be able to understand the ACA (understand how it is made, how it works, what data it is supposed to read, etc.), I will also be able to understand how XML works and how to create the file that is required for the ACA IRS forms. I am interested in this project because Professor Bailey shared his idea and we decided to follow it.

Sanjeev Dasari: I am interested in Software Engineering, Data Analytics and Full Stack Development. I don't have a lot of experience with XML. But I have some experience in

database management with SQL server management. I am from New Delhi, India. I took database classes and web development classes.

Review of Relevant Design Norms

Justice Norm - this design has to respect the rights of all employers, every information given by the employers is private, and has intellectual property. Other employers may not access the form. There is also transparency connected to this design, it deals with open communication and this norm provides employers to be honest with the information they are giving. The ACA IRS employers are responsible to review these forms, we provide them with a transparent view of the employees data recorded in the form. Employees have to add their personal information, address, monthly coverage, taxes, business information, and more. This way, the ACA employees can view the information given and keep their records in a secured place without allowing others to access their private information. Our XML based form will be user friendly and straightforward. The database will be cleaned and organized well so that anyone with basic software knowledge can understand.

Research Question

As the people in Congress pass the Affordable Care Act, we are analyzing how much time and money it costs the employers to send all the details as per IRS guidelines. They need to have robust systems to send the IRS the documents and it takes software developers hundreds of hours to make a good system and database to comply with the IRS. Our main goal is to find the cost and the secondary effects of this ACA on the IT industry and the employers.

Development Approach

We will use a phased iterative implementation approach for this project. We will build the database and then validate it towards our front end and then refine it. For the second step, we will investigate how to create a pdf form with the database data and then turn it into an xml. For the next step, we need to equate our xml to the schema given by the IRS, which will include modifying things that don't work out well, and then we'll bring our program through the official testing scenarios needed for submission and eventually provide a cost estimation of the impact of this technology.

Quality Assurance

Critical Delivery Dates

September 1 - Team formed with identified project

September 15 - Project Proposal draft and delivered to advisor

October 1 - Submit Project Proposal to advisor and project course coordinator

November 23 - Schedule for project status and prepare presentation

December 1 - Present Project Status Report

December 15 – Complete Basic working database that can store the details from the forms to convert the pdf into an xml format. Submit a draft project website.

February 10 - Change of plans (2 members of the project left). Got help from Bailey and Vander Linden for the next steps of the project

May 8 – Complete Video Presentation and post it on the website

May 13 – Submit Final Report, code, and website to project course coordinator

Completed Work

- Share project idea
- Submit project proposal
- Create and implement SQL file
- XML prototype
- Project Presentation
- Website
- PHP file to read XML file
- Connect PHP and Microsoft SQL Server using WAMPServer
- Information entered by user is saved in database
- Create both 1094C and 1095C Forms using PHP, HTML, and SQL
- Data is saved in the SQL when pressing buttons in the forms
- Marcos - Record Video for his Demo (show updated demo he made)

Reviews

We plan on conducting a Software Management Review. Where Professor Bailey is going to evaluate our work status.

2021: Professor Bailey will evaluate the IRS requirements in both forms. We will send a ZIP file that contains a report, code, video, and website to the course coordinator.

Testing

For Testing we are going to undergo Rigorous testing of the system to support the official testing scenarios required by the IRS for XML submission using the testing document at https://www.irs.gov/pub/irs-pdf/p5164.pdf where we must undergo twenty-one testing scenarios to insure everything works as required.

2021:

For testing, we will use the server created with WampServer to access 1094/5C Form made with the PHP connected to the database and fill the data that is available in the server . As the user submits the data in the database, we will use SQL clauses to show the data.

Problems encountered and how you overcame them

- Originally we started as a team of 4 people but now we are only 2 working on the project
    - Due to the loss of team members, the project was reduced to two separate efforts.
- Programming languages were not working.
    - We decided to work using Python but we had issues with running it
    - We then decided to use PHP to read the XML files and gave us better results
- Future work on this project.
    - 2 members left
    - Build a command line application (still in development)
- Extracting data from the forms
    - We used PHP to extract all the data from the 1094C and 1095C forms

- We were given an example on how to create a manifest in C#, but the example did not work when I ran the code. I attempted to write it in Python but the results did not change when running the code.
- To solve this I found a solution which is to use PHP and HTML to make both forms and connect it to the database. This approach was successful and gave great results.

Appendix A

Test Plan

Unit Testing

General Approach

For the project, developers will test their code with every change or developments they add in the project. As we work on implementing SQL, XML files, and forms we will share our thoughts/ideas of how the new feature works and why it was decided to use that method. Together, we will test the implementation of the project and detect errors or if there are any new ideas as to how we can update it to come up with a remarkable result. If the program works and exceeds our expectations, we will add it to our git and then it will be available for testing.

Equipment/Resources

SQL file (database), ACA IRS Forms (1094/5C), PHP,WampServer, Web server

Testers/Volunteers

Marcos and Sanjeev.
Professor Bailey.

Function Testing

General Approach

For every table created in the database, we will make sure that the data entered in the form is saved and recorded. Adding features to the PHP file will make it easy to understand its functionality. Users will be able to manually fill in the form (1094/5C) and submit it when done to store it in the database. Once the information has been submitted, we will be able to see their records saved.

Equipment/Resources

The form will be ready for testing when downloaded from github.
A text document with instructions will be added in our git

System Testing

General Approach

Our testing involves the program undergoing different scenarios where each scenario contains all the information needed to prepare both forms.

The scenarios are going to test the functionality of our business rules.

In order to pass the test our test submissions must match the scenarios exactly.

Equipment/Resources

1094C Form guideline

1095C Form guideline

Testing Document,

Schema and Business Rules for 2020,

Guideline on submitting XML reports

Testers/Volunteers

PROFESSOR BAILEY

The application must meet the IRS testing scenarios defined at
https://www.irs.gov/pub/irs-pdf/p5164.pdf

Acceptance Testing

General Approach

Code will be tested to see whether it meets the requirements needed for the ACA IRS forms to work correctly.

Equipment/Resources

Both forms will be ready for users to submit their information. We used 2018 Microsoft SQL server Management Studio,

Possible Future Work

- Improve manifest file to execute correctly and load both forms from ACA IRS.
- Sanjeev will continue the development of this project for 2021 - 2022
- Professor Bailey will give him guidance as for future steps for the implementation and continuation of this project.
- Export the data recorded in the database in a .pdf or .xls file.