## Project Proposal

Name: Rayan Wali

Project Name: Y.E.S. Web App

Teacher: Ms. Lorena (Period 5)

Topic to be addressed:

My topic incorporates a web-based application with database as a backend that allows students to capture and submit Y.E.S. volunteering hours online. There is no need for students to print their form and get approval from the volunteering organization. Upon submitting the form online, the workflow will kick-off which sends an email notification to an authority with a clickable link to either approve or reject the submitted form. Based on the response, the submitted Y.E.S. form can either be auto approved or rejected. This application eliminates the paper-based tedious manual approval and the management process and makes the entire process eco-friendly.

Problem to be addressed:

The Y.E.S. volunteering hour storage process takes a long time and is not efficient in terms of organization and storage of a log of hours.

Product to be created:

A web-based volunteering hours application with back-end database would allow students to enter Y.E.S. hours online instead of completing and submitting a paper form. Other possible products could be a mobile or a desktop-based application.

Hardware/Software needed:

* **Hardware:** Windows 64-bit web application server accommodating database server as well.
* **Front-end Application Software:** Visual Studio with C#, ASP.NET.
* **Back-end Database:** Microsoft SQL Server.

Describe the social significance of this problem:

The social significance of this problem is that it makes it easier for all members of society to access and transfer information, rather than having to go through the lengthy, inefficient process of manually storing data, which is more prone to losing data. In addition, we will conserve our resources by eliminating paper-based system to eco-friendly electronic system.

What do you anticipate your final product looking like?

My project will be a user-friendly web application where a student will have to enter in their volunteering hours and fill out a form including the sponsor’s email address. The email will automatically be sent to the sponsor and upon approval or rejection of hours, the status will be updated accordingly. There will be various reports and graphs showing the students volunteering hours that are completed and remaining for each year. There will be couple of Admin management screens including the management of the students’ data.

By what criteria will your final product be evaluated?

I will evaluate my final product based on repeatable, efficient and secure storage, retrieval, and management of students volunteering hours data with proper testing performed.

**Instructor Use Only:**

\_\_\_\_\_\_ Approved

\_\_\_\_\_\_ Approved with changes described below

\_\_\_\_\_\_ Not Approved – resubmit

Changes needed:

Rayan Wali

Ms. Lorena

Computer Science IV - Period 5

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Background Research

The topic I am exploring is the storage of data in databases. For any organization, critical information is often stored in databases which can then be used to access and manage the data secure, efficiently, and easily from anywhere. It also allows integration with other data and driving reports and insights from the data. Data is considered a new gold and it needs to be managed, stored, and treated properly just like any valuable asset. Currently, Clements’ Y.E.S. volunteering hours process is a paper based manual process which is not efficient and resource intensive. It requires significant manual process to collect, verify, and store the data in a file cabinet. Driving reports from current and historical data is also a great challenge and students do not have clear visibility of their volunteering hours and need to be provided with a prediction of their hours needed to meet the required hours. In order to optimize the process, I am researching on creating a web based Y.E.S. volunteering hour database application to solve this tedious and inefficient manual process that will allow students to enter the data online and store the data in a database securely.

During the early age of computer, to address data storage problem, a statistician and inventor in 1890, Herman Hollerith, also the founder of IBM, first created a unit record and punch card databases, which uses binary numbers to read data from column to column. This was the first electromechanical data processing system created. The disadvantages of the punch cards were due to the sensitivity of manual punching process, as they produced lots of data errors and inconsistency in the data. Also, the storage of data was quite limited. In 1965, at the CODASYL Conference, set to refine the database management system, The Database Task Group Committee introduced the concepts of data integrity and data model, and greatly stressed the importance of them. Over time, database systems became more complex and were categorized into two models: network and a hierarchical/tree model. While the hierarchal database model structures data as a tree of records, with each record having one parent record and many children, the network model allowed each record to have multiple parent and child records, forming a generalized graph structure. Later, the hierarchical model was displaced by the relational model. The relational model was a conceptual basis of relational databases. Proposed by E.F. Codd in 1969, it is a method of structuring data using relations, which are grid-like mathematical structures consisting of columns and rows which become the basis of relational database. In 1970, a relational database model came out, which included basic operations for working with the data, such as selection, merging, etc., which are commonly used nowadays to deal with large amounts of data and perform operations on them securely, efficiently, consistently, and inexpensively.

Databases are used by many online forms and a wide variety of applications for storing, integrating, and retrieving information. All websites use the concept of databases and the concepts of a server to store their data privately and securely. Some form of storage or databases are behind most of the web applications, such as Amazon, Facebook, LinkedIn, etc., in order for end-users to retrieve and access the data. It is relevant to every area of fields, whether it is the oil and gas, medical, education, or any other. The digitalization of technology data exploding exponentially has led to the concept of Big Data and the challenges around capturing, storage, analysis, sharing, transfer, and accessing data. The demand for it is growing as there is an overload of data coming in structurally, semi-structurally for example, Twitter, or unstructured like photos. With a high volume, variety, and velocity of data circulating online and devices such as tablets and phones, databases are a critical component of any technology stack which should be expandable, highly accessible, secure, and manageable. Security is an important part of any database. The key characteristics of a database are based on ACID, which stands for Atomic, Consistent, Isolation, and Durable.

Security and ACID are important concepts and critical to any application. For example, in my Y.E.S. Web App, a student’s data should only be visible to the intended audience and the data needs to be stored and be reliably accessible. For sensitive information, the data can be encrypted partially or the whole database can be encrypted. The Y.E.S. Web App data is important, but we will not be capturing any sensitive information such as a user’s date of birth, SSN, etc.

Earlier, relational databases were widely used and still being one of the mostly used type of database. However, due to the challenges of big data and digitalization, other forms of databases have been surfaced up to increase the efficiency of storing and retrieval of data. Some of those databases include NoSQL, which is based on a key-value pair and the Graph Database, which is a node-based database used for data related to social networking, etc.

There are various vendors for these databases. For example, Oracle and Microsoft’s SQL Server are some of the commercial database servers available, while some are open source such as MySQL. For the Y.E.S Web App, I will be using a free edition of Microsoft SQL Server Express which needs all the application and data storage requirements. Compared to the Enterprise version of SQL Server, SQL Server Express limits the number of cores to 4, the database size to 10 GB, and enforces other memory limits. For a smaller size application with number students we have in Clements, Microsoft SQL Server sufficiently meets the technical requirements.

To create a web database application, there are different programming language that can be used including Java, JavaScript, Python, PHP, and C# etc. For the Y.E.S Web App, I will be using a ASP.NET web application using C# using Microsoft Visual Studio, which is integrated development environment (IDE) to develop computer programs such as web apps, desktop app, and mobile applications etc. Visual Studio supports various programming languages including C#, VB.NET, PHP, C++, and JavaScript etc. Although there are different IDE’s such as Eclipse for Java development, I found Microsoft Visual Studio to be very intuitive and user friendly. ASP.NET is a web framework to build great websites using HTML, Cascading Style Sheet (CSS) for look and feel, and programming languages like JavaScript, C# etc. In ASP.NET, a web application can be developed using different frameworks for example, ASP.NET MVC, WebForms, and ASP.NET Core. These patterns allow for different ways to manage different aspects of the application components. For example, The Model-View-Controller (MVC) is an architectural pattern that separates an application into three main logical components: the model, the view, and the controller. The Model component corresponds to all the data-related logic that the user works with. The View component is used for all the user interface logic of the application. Controllers serve as an interface between the Model and View components to process all of the business logic and incoming requests, manipulate data using the Model component, and interact with the Views to render the final output.

Applications can access the database in various different ways. In order to access the database, appropriate database drivers are used. For example, ODBC and ADO.NET are commonly used database access providers and are supported in various programming languages. There are different types of database operations which can be performed against the database and supported by database providers. Some of these operations are adding, updating, selecting, and deleting of database records. In order to perform these operations, SQL statements are required to be passed to the database. For example, in order to retrieve all the records from the Student table which stores all the student records, the following SQL statement can be passed to the database:

***SELECT \* FROM Student;***

Both the Web and Database servers can be deployed on different supported hardware. Depending on the storage, computer, and processing power requirements, the hardware can be either scaled up (referring to upgrading the hardware) or scaled out (referring to spreading processing power across multiple computers). For a database driven web application development, the minimum recommended hardware should be a Dual Core Intel Pentium processor, 4 GB RAM recommended for database or combined web/database server, and 40 GB or more Hard Drive disk space.

All of my development will be done on my local machine with a build in the ASP.NET web server. Once the development is completed and tested, the code can be packaged and deployed on any web hosting platform that supports required application components. An alternate option to developing and deploying a web application is using a Cloud platform, which is a subscription-based environment. Based on the usage of storage and processing power, a cloud service provider, such as Azure, charges a small fee for it. The benefits of the cloud platform are that it can provide unlimited storage and processing power.Depending on the application needs, you can either scale up or scale out application and database storage or compute as needed. The model is based on as you pay for what resources you use and comes with greater flexibility and preconfigured commercial and open source applications and databases.

In conclusion, we live in a world where big data and data are growing exponentially. Imagine a world without databases and all these data stored in forms of papers or books somewhere on a shelf with dust. How inefficient, time consuming, and tedious would that be to access current or historical data? We have lost so much valuable information from our history due to a lack of an efficient database system. Clements’ Y.E.S. volunteering application is one such scenario. With databases, we are having all the information at our fingertips efficiently, quickly, and securely, being able to drive the information, wisdom, and actionable insight from these data.

**Citations**

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