Courtroom Management System

CourtBase

Working system that manages the data of multiple entities in a given court house setting

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# What are databases?

In-order for anyone to understand the application of a courtroom management system they need to be provided with a little information about databases. Databases are the structured and organized assemblage / collection of data / information that correlates with one another through special relationships that are formulated through research and development. Databases are stored in the form of digital data on primarily computer systems. The concept of Databases dates-back to as early as the 1960s. One of the few early on concepts of databases is one of the most common examples of a hierarchal system which is basically a upside down rooted representation of relationships in a tree like structure. Such a database would only have a one-to-many relationships. On the other end of the spectrum we have network databases which are much more complex and have multiple relationships schemes hence the many-to-many relationship concept. The structure of a typical database is designed to store data / information in the form of incremental rows and columns which can also be later-on edited and updated. The rows and columns are structured inside a series of tables which are more technically known as entities in a database. These tables in a database can have many relationships to other tables as well or can exist in a standalone position. There are many forms and types of databases each with its own varying attributes and functionalities. The type of database to be deployed depends upon the organization that is going to be using it and the type of task that they will be performing. Depending upon the type of usage we have the following databases:

Relational databases. Relational databases are based on the relational model which is a straightforward way of representing data in tables. In a Relational database, each row in a table is assigned a unique ID which is called the primary key or just a key which allows the database to form differentiation between all the entries. Each column stores the data as attributes of the table which allows for easy establishment of data relationship points.

Object-oriented databases. Short for OODB is a class of databases that stores and represents data in the form of classes and objects. In OOP terminology, an object is a real-world entity and a class is a collection of objects. The chemistry of different relational model aspects like concurrency, transaction when combined with object-oriented programming results in the formation of object-oriented database.

Distributed databases. A distributed database is a database in which data is stored across multiple physical storage location. It is basically a database that is not limited by the number of systems, it is more widespread among different devices that are on the same network or even in a remote location. Distributed databases are further divided into homogenous and heterogenous databases.

Data warehouses. A data warehouse is a repository of huge amounts of data from multiple amounts of sources provided. The sole purpose of a data warehouse is to collect data process and analyze it and to perform queries on it. Many businesses benefit from it as the data warehouse has a lot of data and its analysis can provide useful business insights. A data warehouse may include but not limited to the following foundations. Relational model, ELT solution, Client analysis tool etc.

NoSQL databases. In contrast to SQL database, a NoSQL, or nonrelational database, allows for data to be stored in a more non-tabular form. It is basically a form of database that does not follow the convention of the relational model. Relationships can still be mapped using it but the representation and storage methods are completely different.

Graph databases. A graph database is a NoSQL database, which uses the graph model data which comprises of vertices which are the entities or the relevant pieces of information and the edges are what connect the nodes together to form relations.

OLTP databases. OLTP which is the short form of On-Line transaction processing is a very fast database that is hard-focused on transaction-oriented tasks. The general use of such a database is to process and deal with a large amount of transactions by numerous users. The biggest example of such a system would be of online banking.

# How are databases managed?

A database management system or DBMS is a software tool which is used to create and manage databases. A DBMS makes it possible for end users to manipulate data, update, add and perform other forms of logical operations on databases. One other such function of a database is that it provides a link between the databases themselves and the application program that was intended to access them which ensured readily available data. The functioning of a database is unique. A simple DBMS manages three vital things. It manages the data, the database engine that allows the data to be accessed and manipulated, and the database schema, which is responsible for the logical structure of the database. If all three elements are working properly, the database provides concurrency, data integrity, security and uniform data administrative procedures. One of the most valued functions of a database management system is that it can provide a centralized view of the data which can then be accessed by multiple users, from multiple locations. A DBMS can also restrict the amount of viewership or privileges a certain user has on a database. All the end users and software makers have nothing to worry about how the database is stored physically since the DBMS handles all the requests. A DBMS can protect applications from needing to know where the data is stored and the state of its physical structure. This grants both the user and the application both logical and physical independency to the data. As long as the programs use the API or application programming interface which is provided by the DBMS. Advantages of using a DBMS are a lot but it also comes with processing overhead.   
The DBMS can store data in a central location that can be accessed by multiple users but at the same time it also keeps data integrity intact. Having central storage and management of data using DBMS provides the following benefits:

* Security for the data
* Simplicity in access using API
* Uniform administration
* Robust data integrity
* Ability to recover from crashes.
* Balancing the workload from multiple user access on the same data.

# SQL comes into play

This is the part where SQL or structured Query Language comes into play. SQL is a language which is used to manipulate and communicate with databases. It is the standard for relational databases as stated by ANSI (American Nationals Standards Institute). By communication we mean SQL is the language that DBMSs use to access databases and upon that access it allows for users to create, add, delete, update, manipulate and do many logical operations on a database. Many DBMS use SQL such as Microsoft SQL server, Oracle, Sybase and more.

## Courtroom

The elements of a courtroom can be easily layed out using conventional methods. In every courthouse the record of each session is kept in documents. Each record of the person who attends the session is obliged to provide their information except for the public gallery since that is for the public to attend or for awaiting family members for the plaintiff/defendant. Now considering that all the designated people are “documented”. Wouldn’t it be easier if the entire courtroom had a record of all the people that were in the room when the trial started? Such a system where no anonymous figure would exist. All the records would be intact and the data could not be forged easily. Such a system would be extremely beneficial for a lot of courtroom who are still on the same conventional methods of having to write everything on paper. It just wastes a lot of time when someone would have to go through all those records to find just one name. Wouldn’t it be easier if all that nonsense could be avoided by just one quick search. Yes that is what the CourtBase is set out to solve. CourtBase is a courtroom management system that solves 70% of the problems faced by the record holders working in many district courts where they still use conventional methods. A close up of a device

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CourtBase is a management system that was taken into deep consideration to solve the many issues with modern day district courts. Users of CourtBase will benefit from the following perks:

* Quick and easy setup
* Low cost
* Accuracy of data and reports
* Strict security
* Authorized access only
* Auditing change to existing data
* Recording and maintaining of profiles
* Cloud storage for remote work

I have carefully studied multiple district courthouse rooms and observed who does what and when. It was only through a week of observation that I came up with the following ER diagram which would hypothetically A close up of a map

Description automatically generatedrepresent a normal trial case being held in a courtroom: a district courthouse.

The above-mentioned ER diagram has the following tables or more precisely entities in it and I will briefly try to explain each entities role. There is a provincial/High court followed by a District court. The provincial/High court is of higher authority to the district and therefore the district house is accountable before the provincial/High court in any case of civil rights or criminal persecution. Since the amount of district courts is abundant, each district court would be given a special ID that would be unique for that court only. That will remain intact until a legal bill is passed to change the ID or the courthouse is moved to a new location. The court would have different courtrooms for different types of trials. Hence forth I have added the courtroom table to accommodate each room with its own information. Each room will have its own unique ID and it will be its own special identifier. Further down the diagram we have the spectators who are usually the public attending public courthouse settings. Among might also be family members or friends of the people who are on the panel. Every person who enters the courtroom will have to provide identification and a record will be made about their presence in the gallery for redundancy purposes and to keep watch on who and what goes in and out. After that we have the Jury panel. All members of the Jury will be required to enter their Badge ID numbers and their names to keep track of all the cases that the Jury was presented before to avoid any misunderstandings in the future. A courtroom clerk before the court session commences will enter his or her name in the fields to keep record of who they are going to be bringing to the court before the Judge. Also the clerk’s number of records would also be great for factual data for every year. After that we have all the relevant entities that exist in a court of law.

# Reasons behind the study

In courts, the Judiciary is the system of justice in any country. It is the governments duty and responsibility to administer proper justice. The 21st century has breathed new light into the world by solving existing problems of many disciplines. Technology is one of those fields that has seen rapid growth in the past few years then anything anyone has ever seen before. It has paved a way for quick and easy solutions for problems that no one ever thought would be possible. It has adopted over the years to overcome inefficiency and ineffective solutions. Records of Judicial matters is one such field where technology is going to help a lot. Many challenges have been faced by people with mis matched timings, replacement files being lost, important documents posted to the wrong address and all sorts of problems that any conventional court would have to face. Courts nowadays should consider moving alongside the rapid flow of forward moving technology of paramount importance. Following are some of the objectives of the project :

* To implement an electronic courtroom management system that would allow the data of any trial be recorded and be publicly available to everyone for information purposes only.
* The information will be entered by users i.e the Judge, clerk, spectators etc. but only administrative authority would have access to change the information while everyone else could only view the information as public knowledge.
* To develop a user-friendly interface for ease of access and ease of use.
* To create a database for a courtroom that would store, manage, update information about everyday trials in the courtroom
* The database can also be used for statistical analysis. These analysis can be performed in any manner by the user on any entity they desire.

When the project is complete, it will benefit the following target demographic :

* The industry for Judicial services
* The society
* The academics

## The Judicial Services

The system will be used by the Judicial services and all the present bodies in a trial would enter their respective information which can then be accessed by the public too. The registrar can do data processing i.e the retrieval and storage of data which involves creating, updating and modifying information.

## The Society

The system will allow almost every client and public user to access the database to retrieve information on cases that occurred in a specific courtroom and also perform many statistical operations on it. Only authorized personnel would be allowed to change or manipulate and or modify the data stored. The information for the public would be available online through the built website for access to the database. The website is still in development phase and is still optional.

## Academics

This project in future (I hope so) will help many students. This project will demonstrate how open-source tools can be used to make web-based applications making academics aware of the potential benefit of using such software. The exposure to such tools allows for bright young minds to quickly catch onto the scenario and start developing themselves.

# Explaining relations

According to the above provided ER or Entity Relation diagram I can explain the relationships in the form of words for each in both directions:

* Only one provincial/high court can keep many district courts accountable or many district councils are accountable before only one provincial/high court.
* One district court can have many courtrooms or many courtrooms can be exist inside only one District court
* Many courtrooms can have many spectators or many spectators can attend many courtrooms
* Many Sheriffs can be appointed to many courtrooms or many courtrooms can appoint many sheriffs.
* Many Jury panels can exist in many courtrooms or many courtrooms can have many jury.
* Many courtrooms can have only one clerk or only one clerk is allowed in many courtrooms.
* Many Judges can have a session in many courtrooms or many courtrooms can have many Judges
* One courtroom will have only one plaintiff or one plaintiff can exist only one courtroom
* One courtroom will have only one defendant or one defendant can exist only in one courtroom
* One Judge will keep only one defendant at court or one defendant will be answerable before one Judge
* One Judge will keep only one plaintiff at court or one defendant will be answerable before before one Judge
* One Judge will have information about each law firm or each law firm has to give information to only one Judge
* One defendant can have only one lawyer in the court or only one lawyer is allowed to be with one defendant in a court
* One plaintiff can have only one laywer in the court or only one laywer is allowed to be with one plaintiff in a court
* One lawyer can have many firms or many firms can have one lawyer.

# Methodology

The methods for creating such a management system won’t be easy and will require a lot pf storage space and processing power. To build such a system I approached the use of agile model of System Development Life Cycle or SDLC.

The model starts of with a small incremental implementation of the full system and through time and development each new feature and correction is added to the entire framework for the system until it is fully built. According to the agile methodology, the system being built is heavily dependent to the requirements of the user. Since no one asked for such a solution to my knowledge therefore I had to do some primary research and observation in-order for me to make a baseline assumption of the requirements. At each increment and development of the system, modifications were made to the design and new functional capabilities were added. There were many phases ahead for the development of such a system such as, Human interactive response, maintenance, timing, analyzing what the system needed, designing the required system and more.

Upon observing many district courts, it was all narrowed down to how data was being collected and stored. In the majority of the courts, the data was being handled in traditional conventional ways and administrative tasks were just as trivial. Many courts had complaints that people had to travel a lot just to read the case numbers and some even wasted their time because their number had not yet shown up.

Obtaining this type of information was really helpful as it helped to narrow down to the barebone requirements o the management system to be built. The system that would be designed would cater to all the requirements of the end user and the administrative staff.

Microsoft SQL Server management studio and SQL server will be used as database management and implementation. The development of the web application will require HTML,CSS,JQuery but more on that later.

# Why CourtBase?

In day to day court activities, a robust, reliable, effective and accurate case management system would prove beneficial in terms of court health and public satisfaction. Tax payers would be much better off knowing that they don’t have to visit court everyday for a progress update rather they can just look it up online. The maintenance of case records directly correlates to the timely processing of case data and giving out information. This also applies to the check of data integrity which further verifies data accuracy. There is a visible need for such a system as traditional and conventional are starting to lose their charm.

It is the web that has been a driving force for automation for the past decades and it has been a major driving force in major aspects of worldly affairs like business, finances, banking solutions, education, health and many more. It has emerged to be an effective platform for people to interact with each other, to schedule different events, to make online transactions, making information available to a wider audience in the fastest way possible. According to the internet usage report. Approximately 4.39 billion people are using the internet as we speak. These statistics were released in 2019.

Not only is internet good for knowledge but it is a platform for many to earn as well and that has a huge positive impact on the economy as well. Since stock market has also moved onto cloud computation for better and faster results with proper analytical results.

It is very clear that people have a tendency to move towards radical solutions rather than sticking to old conventional methods. Which is why I think CourtBase should be top priority for any legal courthouse as it would save a lot of time for many people and it will serve as a redundant storage solution for all records to be maintained that also cannot be forged in any way. This will eliminate the fatigue of having to write everything on paper and having to pin it up on a notice board. Rather they can just save everything on a database which would automatically display itself on the application website. This would effectively allow people sitting at home to check new information on the website so they don’t have to bother themselves by visiting courts everyday only to find that their case has made negligible process. It is advisable for almost all major courts to shift to a digital system as that will come in handy later on in the health of the structure.

# Web Application (Optional)

Since the database is to be accessed by many public users on the internet, it is an essential requirement for the database to have a web application. Web apps are becoming more and more popular day by day. Their functionality increases by many folds every day. A web application is a client-server program that allows the client to run in a web server. Web apps are popular due to their ease of access through web browsers which also comes with the convenience for the client to update and maintain data stored locally or on a serve. The following languages and software will be used to create the web application for the CourtBase system (Some languages might not be implemented as depending upon the tie of delivery and relevancy of its use):

* HTML5
* CSS
* JQuery
* SQL
* Javascript
* PHP
* WAMP server
* Microsoft SQL server 2019
* Microsoft SQL server management studios 2019
* Microsoft Visual studio 2019
* Sublime
* Dreamweaver

Our HTML, CSS and Javascript will be used for designing and implementing the front end of the web app. The front end is basically the front page that anyone sees when they access any website. There will be different templates for the clients to choose from son there will be no dry content. Microsoft SQL server will be used to store databases and Microsoft SQL management studio will be used to access the databases and perform multiple logical operations and data manipulations on it. Such tasks will require huge amounts of processing power which will be provided by the systems existing in the court. PHP will be used as a scripting language on the server side to interact between the Databases. Sublime and dreamweaver will be used to make final coding adjustments and a cleaner looking file system. I will use wamp server to test out the database on a local server and will try to access it on all the local devices to see if it is functioning properly or not. After that all the files will be handed over to the trusted client who will assign a trusted domain service to host their web app. Bare in mind a web app is still something that is optional and is not yet fully implemented. It will be time consuming and may take several days or even weeks to deliver the final product. This portion was put here just in case the web app is partially made and will be used to represent what the underlying front end might end up looking like or it could serve as a basis for evaluation for the client to see what their application might end up looking like. A screenshot of a computer screen

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This is just a reference image to show what the final product may end up looking like. Now obviously it doesn’t necessarily have to look like it but it should serve as a baseline reference what to expect from the application. It is to be noted that all files will be handed over to the proper authority figure and I will keep the secrecy of the files intact since the safety of it is paramount importance.

# Conclusion

I have developed a web based application that has a very high chance of helping the court system to become more streamline with smoother transitions. It aims to help people save their time and efforts. I have done the best in my capable power to make this project a viable solution and I have high hopes that this project meets the stated aim. I am grateful to have been working on such a project. I have an amazing support group that helped me.

*References*

(*GHANA TECHNOLOGY UNIVERSITY COLLEGE ( GTUC ) FACULTY OF INFORMATICS TITLE : ELECTRONIC COURT CASE MANAGEMENT SYSTEM ( FOR LAW COURT COMPLEX ) A Project Work In My Own Academia Research BY : LAUD RANDY AMOFAH*, 2017)

Franklin, Jack L., et al. "An evaluation of case management." *American Journal of Public Health* 77.6 (1987): 674-678.

Stonebraker, Michael. "SQL databases v. NoSQL databases." *Communications of the ACM* 53.4 (2010): 10-11.

Halpin, Terry, and Tony Morgan. *Information modeling and relational databases*. Morgan Kaufmann, 2010.