

Teaching Case

Comprehensive Relational Database Design and Development for Local Church: A Teaching Case Study

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Abstract

Thousands of organizations depend on the accurate recording, updating and tracking of their data on a real time basis. Employees use this data to complete accounting reports, calculate sales estimates and invoice customers. Without database management, tasks have to be done manually and take more time. However, with this database management system *the local church* will now have the right tool to manage data efficiently and allows users to perform multiple tasks with ease. Users will now have the ability to store, organize and manage a large amount of information within a single software application. It will also increase efficiency of the organization, reduce overall costs, and give more control over data. Staff members will now be able to keep records and generate reports of contacts, attendance, donations, involvement in different ministries for members and visitors; records for special events and various activities.

Keywords: Case Study, Database Design, Database Development, MS Access, SQL.

1. CASE SUMMARY

Established in 1994, this local church (we will call "*the church*") has about couple of hundred regular members and many visitors who are not listed as members. It is an event driven ministry focused on enhancing, fortifying, and sustaining the integrity of the modern family. The goal of *the church* is to impact singles, couples, and families.

However, keeping track of the members and visitors record has been a challenge over the years. Currently *the church* manages everything manually. Without a database management system, administration finds it difficult to

organize and control the data. There has also been issue of concurrency, security, no data backup and recovery or the integrity of members' information.

With this new database management system, the organization will be able to handle multiple types of data. Some of the data that are easily managed with this type of system include: employee records, members' information, donation, event management, and pastor sessions. This system is built to be extremely versatile.

Without database management, tasks have to be done manually and take more time. Data can be

categorized and structured to suit the needs of the organization. Data will be entered into the system and accessed on a routine basis by assigned users. Each user may have an assigned password to gain access to his/her part of the system. Multiple users can use the system at the same time in different ways.

The new system will make it easier to generate various needed reports on daily basis using SQL queries.

This will also have the advantage of data integration, which will give the staff the flexibility to look up and modify contact information to create, edit and update data in database files. Once created, this database management system will make it possible to store and retrieve data from those database files. In addition to many other advantages, this database management system will also provide the following functions:

- **Concurrency:** concurrent access to the same database by multiple users
- **Security:** security rules to determine access rights of users
- **Backup and recovery:** processes to back-up the data regularly and recover data if a problem occurs
- **Integrity:** database structure and rules improve the integrity of the data

2. FUNCTIONAL REQUIREMENTS

The purpose of this database is to enhance *the church's* ability to manage and keep track of the church record including the information for members and visitors, pastors, ministry leaders, donations, volunteers, and various activities. For examples members: which includes member ID, first and last name, address, contact information, email address, and date of joining. Management will be able to easily access this information without going through hundreds of records. Also they will be able to add and delete records to keep their information up to date. Events are another aspects of the church record within the database. Each event has an event ID number, and details of the event description, date, start and end time and location. This way it is much easier to keep track of upcoming events. There are also different ministries. The database will store information about each ministry, for example a ministry's ID number, name of the ministry, the activities they will be having, and who is the head of that particular ministry.

In regards to the donation records, authorize users will be able to keep track of records, for instance the donation ID, the description of the donation for example the ministry the donation is for, the method of the donation where it is cash or checks, the date of the donation and the member who made the donation. This way it is easier for management to generate financial statement at the end of the year. Pastors will also be able to keep a track of their counseling sessions with members and also the duration of these counseling sessions.

The system should also be able to generate reports as needed.

Database Design Requirements

The church has regular paid members. Each member is assigned a unique ID when join. The information need to store for members are: member ID, name, address, phone, email, gender, and date became member. The name and address information should be spread out in simple attributes; such as for name, three attributes should be created: first name, middle initial/name, and last name to make the search easier.

The church also need to keep track the visitors who are not regular member. For visitors, similar information can be stored as members except date of being member. Instead, date of visit can be stored similar to the regular attendance information for members.

The church has seven ministries: Families and Adult, Praise and Worship, Prayer, Children and Youth, Nursery, Internship, and Grow. Each ministry has a leader. Each ministry has a major activity, such as Prayer ministry's main activity is "Sunday morning intercessory prayer". Information need to be stored for each ministry, its leader and activity information.

Each member belongs to one or more ministries, that information also need to be kept in the database.

Pastors information such as pastor ID, name, address, location, date became pastor also need to be stored. In addition, pastor's session information with each member (date, time, hours, etc.) need to be kept.

Staffs' information (ID number, name, address, phone, email, title/position, and date hired) need to be stored. All staffs work as volunteers, so

there is no salary information need to be stored in the database.

Each ministry organizes various events throughout the year. The event information such as event ID, even description, date, start time, end time, location, and organizing ministry need to be stored in the database.

Information about donation from members also need to be kept. For example, amount of donation, date of donation, donation method (check, cash, credit/debit card, etc.), purpose of donation need to be in the database.

All the database tables need to be created for the above described information. In addition, an entity-relationship (E-R) diagram need to be created that will display all the tables with corresponding tables and relationship among tables.

Forms Requirements

The church administrators and staffs need three types of user friendly forms: the *input forms* – are data entry forms that enters/stores data into database, the *application forms* – uses information from multiple tables to produce related table information, and the *switchboard form* - allows the users to navigate around their database. The functional requirements of these types of forms described below.

Input Forms

Input forms allow user to enter, update, delete, or query specific record in a given table. The forms should be user friendly and easy to navigate. Input forms are to be developed for the following tables:

- Members/Visitors
- Pastors
- Ministries
- Events
- Donation Type/Purpose

Figure 1 (see Appendix 1) shows a sample members input form ((actual form can be different)).

Application Forms

Members Ministry Form: This is the entry form for a member to designate which ministry or ministries he or she belongs to. A member can join more than one ministry and the records need to be kept for each of them including date of joining to each ministry.

Pastors Session Form: This is entry form for each session of a pastor with a member. Date,

time, and duration of the session need to be stored.

Donation Form: This is form to keep track all the donations members make including date and time of donation, amount of donation, donation method (check, cash, debit/credit card), and purpose (such as for construction, buying books, etc.)

Switchboard Form

The switchboard is a form that allows the users to navigate around the database application. This switchboard form to be made of buttons that users click. These buttons are programed to open forms, reports and queries. This is first/main form opens when a user opens the database application. Figure 2 (see Appendix 2) shows a sample (not actual) switchboard form. The switchboard in Figure 1 shows two components/labels: *Reports* and *Add/Edit Data*. *Reports* side allows users to generate reports based the queries that was programmed. For example, to get the report of the *Quarterly Donation Report*, the user would click on the *Open Quarterly Donation Report* button. *Add/Delete Data* side allows users to add new data through input and application forms as well as edit data as necessary. Users would need to click on the corresponding button for specific action.

Queries Requirements

The database should have the capability of extracting accurate and meaningful information. The church staffs should be able to extract and filter information for daily business operations and answer questions.

The headings of the query columns are to be very clear, concise, and accurately describe the contents of the columns. When printed out, all query columns are to be fit on standard paper in landscape mode (11" by 8 1/2"). The following queries are need to be created using the name as given.

1. **Members List:** List the members and their contact information (including telephone, address, and email), gender, and date became member sorted by last name and then first name.
2. **Visitors List:** List the visitors and their contact information (whatever available) sorted by last name and then first name.
3. **Pastors List:** List the pastors and their contact information (including telephone, address, and email), date became pastor, and

which ministry he/she is leading (if any) sorted by last name and then first name.

- 4. Ministries List:** List the ministries including ministry name and leader name, sorted by ministry name.
- 5. Events List:** List the events including event description, event date, start time, end time, and location sorted by date.
- 6. Pastor Session Statistics:** A query to display the sessions conducted by each pastor (including pastor name, member name, session date, session start time, and session duration).
- 7. Member Ministry Statistics:** List the members with the corresponding ministries they belong to. Sort the result by member's last name.
- 8. Donations:** List the donations including date the donation was made, donation amount, and method of donation sorted by date.
- 9. Ministry Event:** List the ministries (ministry name) and the events they organize (event description) sorted by ministry name.
- 10. Number of Members:** A query to find the total number of members.
- 11. Donation Above \$500:** A query to find the donations more than \$500 (date, amount, method of donation, donation purpose/type, and member's/donor's name).
- 12. Total Donation in Specific Date:** A query to calculate the total amount of donation received by *the church* in a specific date. Provide the date as a parameter.
- 13. Upcoming Events:** List the upcoming/future events including event description, event date, start time, end time, and location sorted by event date.
- 14. Donor Member:** List the members (name and contact information) who made some donation.
- 15. Local Members:** List the members with their contact information who live in the same zip code (the same code of *the church* – 70126).

Report Requirements

The church management will need several reports to manage the operations and make future

decisions. The following are the most important report it needs.

- 1. Donation Report for Specific Date:** This report will display the total donation received for a specific date.
- 2. Number of Events by Ministry:** This report is to display the total number of events organized by each ministry.
- 3. Member with Highest Donation:** This report to display the member name and contact information who donated the highest total amount so far.
- 4. Member Donation Report:** This report to display the donation details (donation date, amount, method) for each member (member name and contact information).
- 5. Average Session Hours:** This report is to generate the average number of hours spent in sessions with members by each pastor.

3. DELIVERABLES

Deliverable One

Identify all entities, corresponding attributes, primary keys, foreign keys, and develop an entity-relation (E-R) diagram. Make sure cardinalities are mentioned for each relation and solve any many-to-many relationships (add new table breaking the many-to-many relationship as needed). Provide details for each attribute including data type, field size, required or not, and so on. Consider the database to be in third normal form (3NF).

Deliverable Two

Revise the previous E-R diagram (if needed). Create all tables with appropriate data types in MS Access. Assign primary keys and build the E-R diagram with options: ensuring referential integrity, cascade update, and cascade delete. Enter data in each table. Create your own data (at least 10 records in each table) where data are not given. For example, names of the ministries are given.

Deliverable Three

Deliverable three should include the followings:

1. Correct all errors in previous deliverable (if any).
2. Create input forms, application forms, queries, and reports.

3. Create a navigation menu using the Switchboard manager to navigate between forms and reports.
4. Insert value added features such as colors, graphics, logo, text formatting to increase the readability and visibility of the forms and reports.

4. CONCLUSION

The local church needs your help. *The church* does not have sufficient money to purchase a system from commercial vendors. Currently *the church* is managing its data manually in paper based system which is time consuming, inefficient, and less secured. *The church* need an automated database management system to store and retrieve data efficiently, searching for information quickly, and generate desired reports in real time. Help *the church* to make the computerized database management system and become more efficient.

Appendices

Appendix 1: Sample Input Form

The screenshot shows a web form titled "Members" with a purple header. The form contains the following fields and controls:

- First Name: Text input field
- Last Name: Text input field
- MiddleInit: Text input field
- StreeNo: Text input field
- StreetName: Text input field
- City: Text input field
- State: Text input field
- Zip: Text input field
- CellPhone: Text input field
- HomePhone: Text input field
- Email: Text input field
- DateofJoin: Text input field
- Visitor:
- Buttons: "Add New Member", "Save", "Delete Record", and navigation arrows.
- Sex: Radio buttons for "Male" (checked) and "Female".
- Footer: "Record: 4 of 9", "No Filter", and "Search" options.

Figure 1. Sample Input Form

Appendix 2: Sample Switchboard Form

The screenshot shows a switchboard interface titled "The Church Database Management Systems". It features two main columns of buttons:

- Reports Column:**
 - Open Quarterly Donation Report
 - List of Visitors
 - Pastor Sessions
 - And so on...
- Add/Edit Data Column:**
 - Members Form
 - Ministries Form
 - Pastor Session Form
 - And so on...

Figure 2. Sample Switchboard Form