

Teaching Case

A Systems Analysis and Design Case: ABC Church

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ABSTRACT

The information systems (IS) profession requires a diverse blend of technical and non-technical skills. To develop these skills, IS educators often use group projects in systems analysis and design courses, sometimes involving written cases. This article presents a case that can be utilized for a group project in a systems analysis and design course. The case is sufficiently detailed to stimulate students' creative thinking about a systems solution. It also concerns an organization with which most students have some life experience, a church. The case emphasizes the church as an organization with information needs. This article presents background information about the case, the text of the case, and a discussion of analysis and design phase requirements. Teaching notes and possible solutions for selected project requirements are also provided. These materials are designed to be useful to systems analysis and design instructors who want to use a written case for a group project in their courses.

Keywords: systems analysis and design, systems development, case

1. INTRODUCTION

Various studies have shown that employers value teamwork, problem solving, and oral and written communications skills in information systems graduates as well as technical skills (Lee et al. 1995; Richards et al. 1998; Tang et al. 2000-2001; Van Slyke et al. 1998; Young and Lee 1996; Cappel 2001). The need for a broad range of skills in new information systems (IS) graduates is also recognized in curricula models for IS programs (IS'97 Model Curriculum; IRMA Curriculum Model).

Systems development often occurs in the workplace in a team environment. Effective development involves not only understanding systems concepts, but being able to apply them to specific situations. Consequently, IS advisory board members often stress to educators the importance of teamwork and problem solving in the IS curriculum.

To develop students' technical and non-technical skills,

many information systems (IS) educators utilize group projects in systems analysis and design courses. Broadly speaking, two major alternatives are available for the use of cases. First, an instructor can assign a system development project for an actual organization. This approach is sometimes driven by requests to instructors for systems from parties on or off campus. Alternatively, students can be asked to locate their own client for a development project. Systems development for "real world" clients has a number of important advantages including: realism, the ability to interact with clients, and the potential to produce a system that is useful to an organization.

However, several challenges are also raised by this approach. First, it may be difficult to find clients with suitable projects that are "doable" in the limited time frame of a semester or quarter. Second, this approach depends upon the availability of organizational personnel to meet with students in interviews early in the semester and periodically throughout the course. If company personnel do not provide adequate support for

a project, it can get hopelessly behind. Finally, if students are allowed to locate their own clients, they will work on different types of systems for different businesses. This places a greater burden on the instructor in terms of time and complexity, and it does not provide a common vantage point for all students in class discussions.

For these reasons, a viable alternative in many situations is to use a written case for a group project in a systems analysis and design course. Ideally, a written case should possess several qualities. It should be interesting, realistic, and challenging to students, without being overly complex. A case should concern a type of organization and subject matter with which most students have some level of experience. This helps students in conceptualizing the problem and possible solutions. The length of the case is also important. A case should provide sufficient details about the problem and situation to allow the project's requirements to be fulfilled. Yet, a case that provides too many details may limit students' creativity, problem solving, and ability to formulate relevant questions.

2. BACKGROUND

This article presents a written case that is designed to be engaging, realistic, and sufficiently detailed for use in a group project in a systems analysis and design course. The author was inspired to write this case after reviewing existing published cases in textbooks and other sources. While some good cases were available, many others were either too lengthy, detailed, or complex, or too brief and insufficiently detailed to be "usable."

The case presented here was utilized for a semester-long group project in an undergraduate systems analysis and design course at a large public university in the Midwest. This course is the first of a two-course sequence that IS majors take in systems development. This course focuses primarily on analysis and design, while the second course gives greater emphasis to systems implementation. While the focus presented here is on analysis and design issues, the case could also likely be used as is, or in modified form, for a systems application development course.

Students worked in groups of approximately five members to address this case in two phases. The requirements for the first phase, analysis, were submitted approximately at mid-semester, while the second phase (design) requirements were completed by the end of the semester. In addition to the written requirements, each group made a presentation about either the analysis or design phase as randomly assigned by the instructor.

The case is about a fictitious church, but its details are designed to be realistic based on an analysis of written documents and the authors' personal experience with a specific church. The organization in the case is called "ABC Church" to avoid any reference to a specific religious denomination, which might offend some students. Instead, the case emphasizes the church as an organization with informational needs. In this regard, it is not unlike many other types of organizations. For example, to remain viable, this organization must track its sources of come just like other for-profit and non-profit enterprises. The case also raises the issue of members making and satisfying financial pledges, which are activities that exist in other settings such as for non-profit, hospitals or public television stations. Thus, in many ways the church's operational activities are generalizable to other types of organizations.

The text of the case is presented next. Note that the scope of the system involves revenues and record keeping requirements for ceremonies. While the church would also have other operational aspects such as the payment of expenses, these are not considered for purposes of this case. The remainder of the article presents a discussion of project requirements for the analysis and design phases, along with some teaching notes about the case and possible solutions.

3. SYSTEMS ANALYSIS AND DESIGN CASE: ABC CHURCH

ABC Church is a fast-growing church in Grand Rapids, Michigan. Over the past three years, since the popular Reverend Timothy Beck has taken over leadership of the congregation, the church has more than doubled in size. It now has approximately 400 registered households. Reverend Jason Howard has also recently been added as a second minister. Since the Church was rather small in the past, most of its records have been kept on paper forms. However, the Church's Business Manager, Margie Robbens, has suggested to Reverend Beck that a computerized system might help the Church better meet its information needs and manage its activities.

In addition to Ms. Robbens, the Church employs a part-time administrative assistant, Mabel McGonahay. Mabel performs clerical duties such as filing, record keeping, answering phone calls, and typing the weekly church bulletin using WordPerfect for Windows on the Church's only personal computer. A retiree, Leroy Strickly, is employed as a part-time maintenance person. Jack Fogerty serves in a part-time, paid position as Choir Director, leading the ten member volunteer choir who practice on Wednesday evenings and sing during Sunday services. Three services are held each Sunday.

The Church also uses volunteer Lay Ministers to assist Reverend Beck in Sunday services.

From a business point of view, one thing the Church must be concerned with is registering new members. When a prospective member wants to join, Reverend Beck holds a personal meeting with that person and his/her family to get better acquainted. Shortly thereafter, the household is mailed pre-numbered envelopes for use in the regular Sunday collections. Most contributions are made to the Church using these envelopes, although about 20% of each collection comes from "loose offerings" of cash and checks. A household also receives an additional envelope each month for use in the Church's capital improvement campaign to fulfill its campaign pledges. Contributions to this fund are collected in Church on the second week of each month. Envelopes are mailed to households toward the end of each month for use during the following month.

The capital improvement campaign has just been established for the purpose of purchasing a nearby property to build additional parking to accommodate the Church's growing membership. The cost of acquiring the property, paving it, and making it ready for use is \$250,000. The Church obtained a bank loan to finance this project, and it makes regular payments on this loan from members' monthly contributions. Households were provided with a pledge form to state their commitment of how much money they would contribute to this campaign over the next three years. As contributions are made, the remaining balance on a pledge is reduced.

Since ABC Church is legally recognized as a non-profit organization, all member contributions are tax deductible. In January, the Church sends the head of household a summary report of all contributions made using envelopes during the previous year for use in income tax preparation.

The Church must also keep track of records of its ceremonies such as baptisms, weddings, and funerals. A baptism is a formal initiation ceremony into the Church for infants and some adults. Adults must first attend weekly preparation classes for three months before being baptized. Besides the parents, a new inductee into the Church also has sponsors called a Godmother and Godfather. For couples who wish to get married in the Church, at least one member of the couple must be a member of the Church. Couples go through weekly preparation classes for two months before the ceremony is performed.

ABC Church is part of a larger network of churches of the same denomination. This denomination has one other church in the Grand Rapids area and over 250

churches nationwide. The regional headquarters for the denomination is in Detroit. The Church's other regional offices are in New York, Miami, and Seattle. ABC Church must submit regular monthly reports to the Detroit office about its ceremonies and finances.

Ms. Robbins and Reverend Beck have hired your small, information systems consulting firm to look into the possibility of developing an information system for the Church. This system will address the organization's revenue sources and its record keeping requirements.

4. ANALYSIS PHASE REQUIREMENTS AND TEACHING NOTES

The components required for the first phase of the project, analysis, are identified in italics and described below. Instructors may choose to make additions, deletions, or modifications to this set of requirements. Most of the requirements were derived from the contents of a systems proposal discussed by Kendall and Kendall (2002).

Introductory analysis phase requirements include a *cover letter* addressed to the organization's management, a *title page*, a *table of contents*, and an *executive summary* of the analysis phase. Teams are required to plan and track their project progress by constructing a *Gantt Chart* and *PERT Chart* using Microsoft Project. These charts are expected to be clear, accurate, and complete in terms of identifying summary tasks, more specific tasks, and the timing and person(s) primarily responsible for each task.

The groups are also required to create an *organizational hierarchy chart* to show the reporting relationships of this enterprise. A possible solution to this chart is shown in Figure 1. Not every detail of this chart is explicitly given in the case in order to stimulate students' thinking and problem solving. For example, in this diagram, it has been inferred that the Business Manager would supervise the clerical and maintenance personnel. The proposed solution in Figure 1 shows the church within its broader reporting context, by indicating the regional and national offices. The solution also assumes that the Head Reverend serves, in effect, as the Chief Executive Officer of the local office, overseeing both spiritual and business operations. The business manager, who reports to the Head Reverend, has direct responsibility for business-related operations. Alternatively, groups can come up with a different reporting structure that is reasonable based on the facts of the case. All groups are expected to explain their assumptions in a narrative description of their diagram.

Since the early stages of the systems development life cycle (SDLC) also involve gathering information

requirements, the groups also have two report components dealing with data collection. The groups write a narrative to describe what *data collection methods* they would use to learn more to develop their system beyond what is already stated in the case. This explanation addresses what techniques (interviews, observation, or surveys) would be used, how, and why. The groups also create a *list of interview questions* they would ask the business manager of this organization. This list is to contain at least fifteen questions arranged into three categories: questions about processes, questions about data, and general questions about the organization.

This stage of the project also requires groups to create and explain a *list of problems, opportunities, and objectives*. This helps students to think more about the shortcomings of the current system, and how their proposed solution would enhance the organization's efficiency and effectiveness. In addition, the groups perform *feasibility analysis*, by assessing the project's technical, economic, and operational feasibility. The groups also perform a detailed *cost/benefit analysis* of their proposed system. This includes itemizing all tangible costs and benefits associated with the development and implementation of the system and identifying and discussing intangible costs and benefits.

The groups are also expected to show a *payback period analysis* of the proposed solution based on the estimated, cumulative costs and benefits.

The analysis phase also addresses process modeling. The groups construct an *organization chart of systems processes* and a *set of data flow diagrams*, including a context level diagram, a level 0 diagram, and several child diagrams that show important, representative parts of their system. A proposed solution to the context diagram, which shows the system, its major entities, and the major data inflows and outflows of the system, is presented in Figure 2.

Finally, the analysis phase requires groups to evaluate the advantages and disadvantages of at least *three alternative solutions* for the case. Broadly speaking, these alternatives may include: leaving the present system intact; purchasing a packaged software solution; or developing a custom application using a relational database management system such as Access. The groups are expected to cover these issues with specifics, not generalities, since they are the systems development experts the client has "hired" to develop a solution. Thus, if groups identify purchasing a packaged software product as one possible solution, they should identify and discuss specific software products. These products can be readily located with modest effort through the World Wide Web. Besides searching on terms such as "church software," groups can also consult websites

such as znet.com or cnet.com that offer various software products for free download. Some packaged church software products that are available at the time of this writing and their web addresses include: Pastor's Plus (www.pastorsplus.com), Faithful Steward (www.church-software.com), and Paluch Church Software (www.jspaluch.com/pcms/pcms.html).

Finally, in the last portion of this phase, groups are required to propose a *recommended solution*, which should logically flow from the discussion in the "alternative solutions" section. Optionally, groups may submit *appendices* containing other supporting documents. Some examples of the contents of appendices include web-based documents used for the cost-benefit analysis (e.g., showing hardware or software costs) or information about packaged software products. Some groups also include "interview notes" taken in sessions with the "client." The instructor serves as the surrogate CEO for this organization and a source of information about the case. Where student groups interview the instructor (which is encouraged), they can include the notes from these sessions in an appendix.

5. DESIGN PHASE REQUIREMENTS AND TEACHING NOTES

The requirements for the second phase of the project, design, are shown in italics and described below. These components represent some possibilities for the design phase; they can be added to, deleted, or modified as needed. Most of the requirements were inspired from systems design issues raised in Kendall and Kendall (2002). It is important to note that even if a group recommended an "off-the-shelf" software solution for the analysis phase, they are to assume custom development for purposes of this phase in order to gain experience with various design elements such as data modeling, and screen and report design.

Introductory design phase requirements include a *cover letter* addressed to the organization's management, a *title page*, a *table of contents*, and an *executive summary* of the design phase. Teams are also expected to update the *Gantt* and *PERT Charts* they constructed in the analysis portion of the project to include the design phase.

Data modeling is also addressed in this stage of the project. The groups are required construct an *entity-relationship (ERD) diagram* and a *list of entities and attributes*, showing relevant field names and keys. A proposed solution for the ERD and list of entities and attributes is shown in Figures 3 and 4, respectively. The ERD indicates that data will be maintained about households and their members, various types of contributions, and ceremonies. In this model, it is

assumed that the household serves as the primary financial contact between the family and the Church. That is, the household makes the capital campaign pledge, pledge contributions, and weekly contributions.

Data is maintained about all individuals who comprise the household in the "registered family member" table. It is assumed that if other members of a family besides the head of household make financial contributions, it is in the form of "loose offerings," i.e., cash or personal checks that are not submitted in church envelopes. A household makes a single pledge to the capital campaign that is paid off in contributions over time.

Ceremonies are divided into separate entities (tables) since they each possess certain unique characteristics. For example, whereas it is relevant to maintain data about godparents in the baptism table, these elements do not apply to other ceremonies such as weddings or funerals. Since the Church has more than one reverend, and the ministers who serve at the Church may change over time, the Reverend table is joined to the three ceremony tables to indicate the presiding minister at each ceremony. It is assumed that a single reverend serves as the "presiding minister" of each service, even though more than one minister could participate in a service.

In the design phase, groups are also required to design several *reports*. These reports should be capable of being generated from the system, and they should provide information that is useful to management for decision making. Groups submit the design of each report along with a narrative explaining its purpose, recipient(s), and frequency. Many types of summary, historical, or exception reports can be generated from this system about Church membership, ceremonies, and contributions. A sample exception report is presented in Figure 5. This report indicates pledges that are 30% or more unpaid as of the end of the first year of the Church's capital campaign. Presumably, these households could be contacted with a reminder so that the overall campaign could stay on track in meeting its goal.

The design phase also addresses screen development. The groups write a *narrative description of the standards and conventions* they used in constructing their system. This description explains the system's menu structure, screen layouts, and security. For example, this narrative covers why screens are laid out as they are to follow the principles of good screen design. Obviously, this explanation should be consistent with the design of the screens themselves. The groups also present a *hierarchy chart of screens* to show the arrangement of their screens from top to bottom. In addition, the groups submit several *sample screens*.

Finally, in the design phase, the groups create a *website prototype* for this organization. This prototype contains a home page and several other pages. These pages are expected to be functional, i.e., have useful content and working links. The groups submit their home page's URL, a hierarchy chart of their web pages, a narrative description of the purpose and content of each page (and additional pages "under construction"), and a printout of all completed web pages. Some ideas for the content of the website is shown in Figure 6. There are, of course, other possibilities, and the organization of content in terms of specific pages will vary across groups.

Most students seem to enjoy this part of the project. While a number of students have created personal web pages previously, most have not designed a website for an organization. Thus, this requirement allows students to think creatively about how an organization can utilize a website to promote its goals.

6. CONCLUSIONS

The case presented here can be used effectively in a systems analysis and design course. It satisfies the critical requirements for a written case of being interesting, realistic, and of adequate length and content.

The case focuses on a type of organization with whom most students have some experience, and it is fairly confined in terms of its focus. Thus, the case is "doable" in the limited time frame of a semester. Instructors who wish to utilize this case could add a few more "wrinkles" to increase its scope or complexity. For example, the case could be modified to include other sources of revenue such as interest income received from banks or investments, or income received from renting the parish hall for wedding receptions and other parties. Alternatively, the other side of the income statement, expenses, could also be considered as part of the domain of the system.

Through addressing this case in a team environment, student can acquire many skills that are valued by employers such as: problem solving, teamwork, initiative, and oral and written communication skills. They can also apply software skills using CASE tools or other diagramming tools, web development software, and project management software. Thus, the project can help students develop technical and non-technical skills important to the IS profession.

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AUTHOR BIOGRAPHY

James J. Cappel, Ph.D., is an Assistant Professor of Management Information Systems at Central Michigan University. He has published more than two dozen journal articles in publications including *Communications of the ACM*, *The Information Society*, *Information Systems Frontiers: A Journal of Research and Innovation*, *DATA BASE*, the *Journal of Computer Information Systems*, the *Journal of Systems Management*, and the *Journal of Business Ethics*. Dr. Cappel's teaching areas include systems analysis and design, system application development, and programming courses. Dr. Cappel holds a Ph.D. in Business Computer Information Systems from the University of North Texas.



Figure 1. Organizational Hierarchy Chart

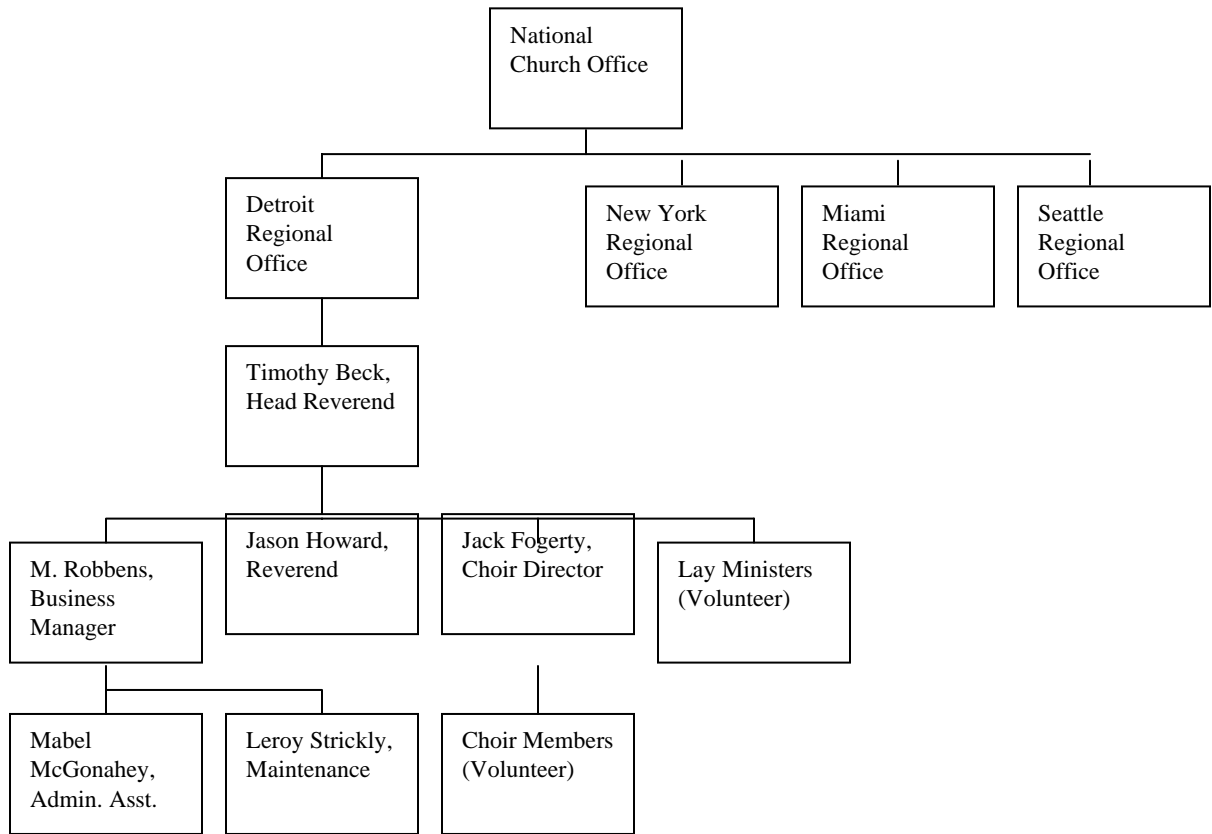


Figure 2. Context Diagram

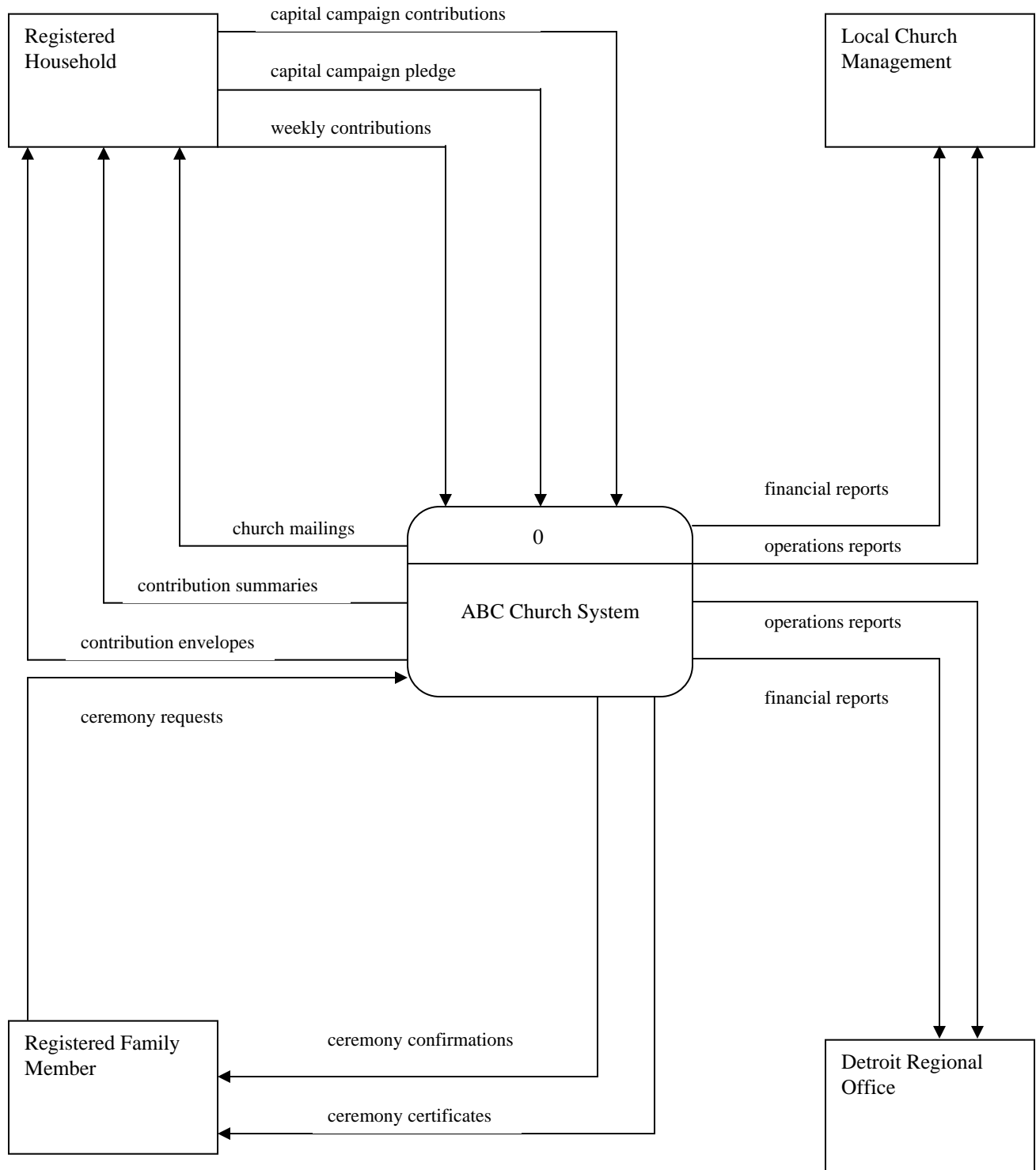


Figure 3. Data Model

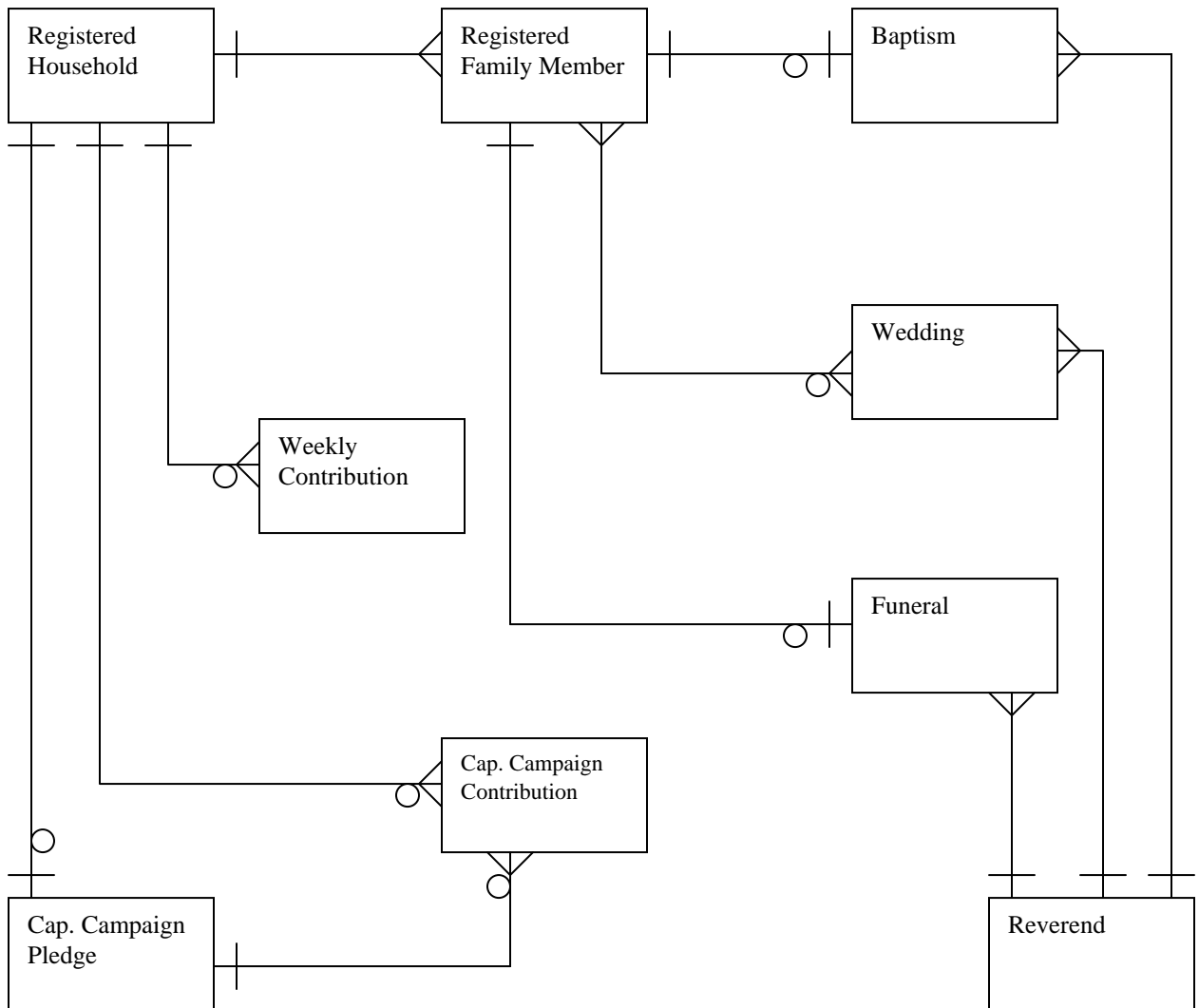


Figure 4. List of Entities and Attributes

<p>REGISTERED HOUSEHOLD</p> <p>* Household number Family name Name for mailings Address, Apt. # City State Zip Phone Family status (single, two parent family, single parent family, couple without children, etc.)</p>	<p>1. REGISTERED FAMILY MEMBER</p> <p>* Member number First name, Middle name, Last name Maiden name, Suffix (Jr., Sr., MD, PhD, etc.) Gender Date of birth Marital status Household role (parent/adult, child) Daytime phone, Evening phone E-mail address Occupation, Employer Baptism data: Yes/No, Date, Church, City/State <i>Household number</i></p>
<p>1. WEEKLY CONTRIBUTION</p> <p>* Contribution number Amount Date <i>Household number</i></p>	<p>2. BAPTISM</p> <p>* Baptism number Date of baptism Godfather data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail Godmother data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail <i>Member number, Reverend name</i></p>
<p>3. CAPITAL CAMPAIGN PLEDGE</p> <p>* Pledge number Amount Date <i>Household number</i></p>	<p>4. WEDDING</p> <p>* Wedding number Date of wedding, Time of wedding Bride data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail Groom data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail Witness data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail <i>Member number, Reverend name</i></p>
<p>5. CAPITAL CAMPAIGN CONTRIBUTION</p> <p>* Pledge contribution number Amount Date <i>Household number, Pledge number</i></p>	<p>6. FUNERAL</p> <p>* Funeral number Date of death Date of funeral Next of kin data: First name, Middle name, Last name, Address, Apt #, City, State, Zip, Phone, E-mail <i>Member number, Reverend name</i></p>
<p>7. REVEREND</p> <p>* Reverend name Ordination data: Date, Church, City/State, etc. Employment start date</p>	<p>8.</p>

Primary keys are indicated with asterisks (*). Foreign keys are shown in italics. In some cases, multiple fields are shown as a continuous entry on the same line separated by commas to conserve space (e.g., for "First name, Middle name, Last name" in the "Registered Family Member" table).

Figure 5. Sample Report

Capital Campaign Unpaid Pledge Report
ABC Church

Date: XX/XX/XXXX

Page 1 of X

Name	Phone	Total Pledge	Pro-rated Pledge (at end of year 1)	Total Gifts to Date	Unpaid Pledges to Date
Jacob Smith	555-2310	\$2,400	\$800	\$200	\$600
Mary Barnes	555-7345	\$1,500	\$500	\$300	\$200
Reeves Family	555-7750	\$1,200	\$400	\$100	\$300
Matthew Ma	555-2396	\$ 750	\$250	\$ 0	\$250
Stern Family	555-0968	\$2,100	\$700	\$200	\$500
Lisa Smithers	555-4420	\$1,800	\$600	\$400	\$200
Mesa Family	555-6395	\$1,200	\$400	\$100	\$300
Lily Almeria	555-5209	\$2,700	\$900	\$300	\$600
Jim Brian	555-6698	\$1,350	\$450	\$200	\$250
Totals		\$15,000	\$5,000	\$1,800	\$3,200

Figure 6. Ideas for Web Site Content

- Contact information (Church name, address, and phone; email link; directions to Church)
- Mission statement, goals
- Church history and description
- Meet the Ministers (ministers' pictures and biographies)
- Meet the Staff (pictures and biographies of the other staff members)
- Service times
- Information about sacraments (e.g., baptisms, weddings, funerals)
- Calendar of upcoming spiritual and social events
- Invitation to join (how to become a member)
- Descriptions of church clubs and committees
- Volunteer opportunities (at the Church and in the community)
- Capital campaign information
- What's new (recent Church news)
- Links to the regional and national Church offices