CS6403 Software Engineering

Tutorial 2

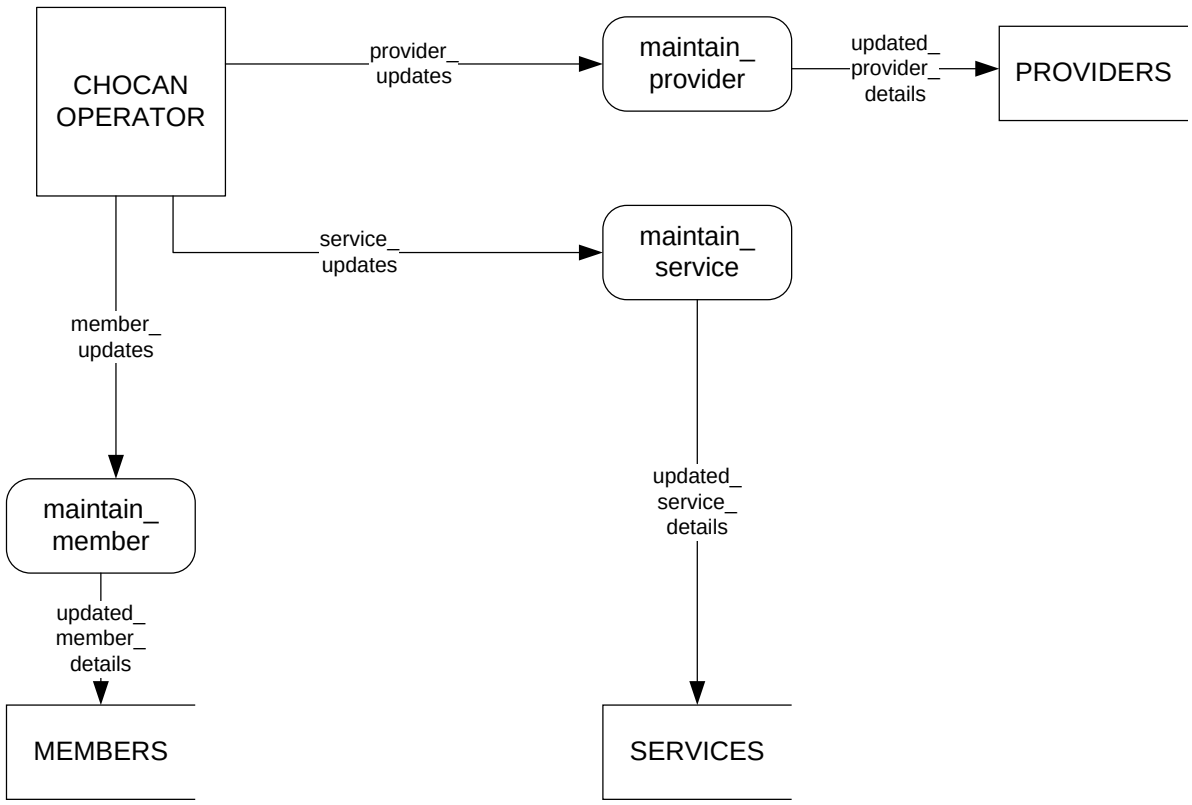
CONSIDER THE TERM PROJECT (SPECIFIED IN TUTORIAL 1) ON CHOCOHOLICS ANONYMOUS

Using the technique specified by your instructor, draw up a specification document for the Chocoholics Anonymous product.

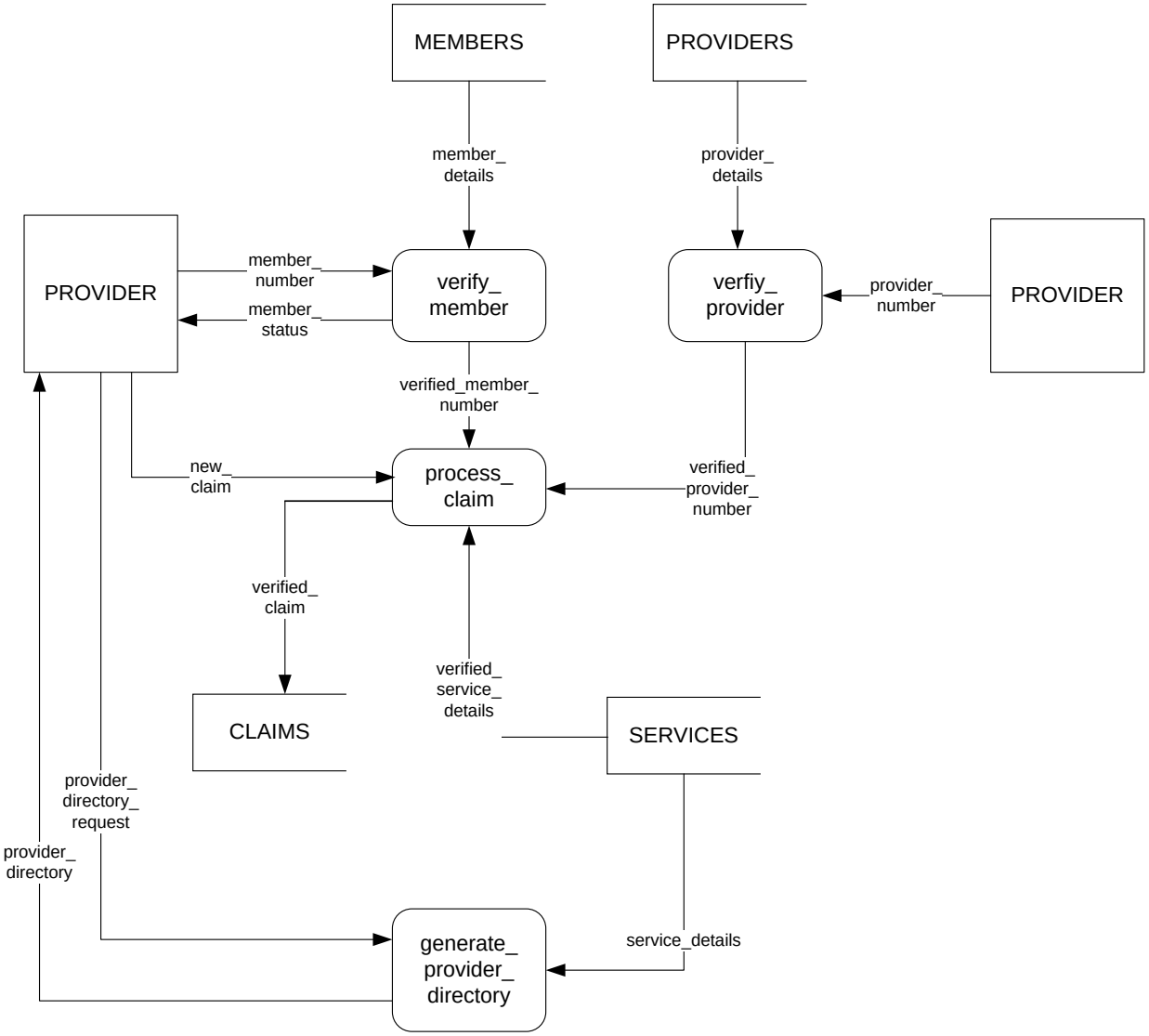
Draw up a software project management plan for the Chocoholics Anonymous

Step 1. Draw the data flow diagram.

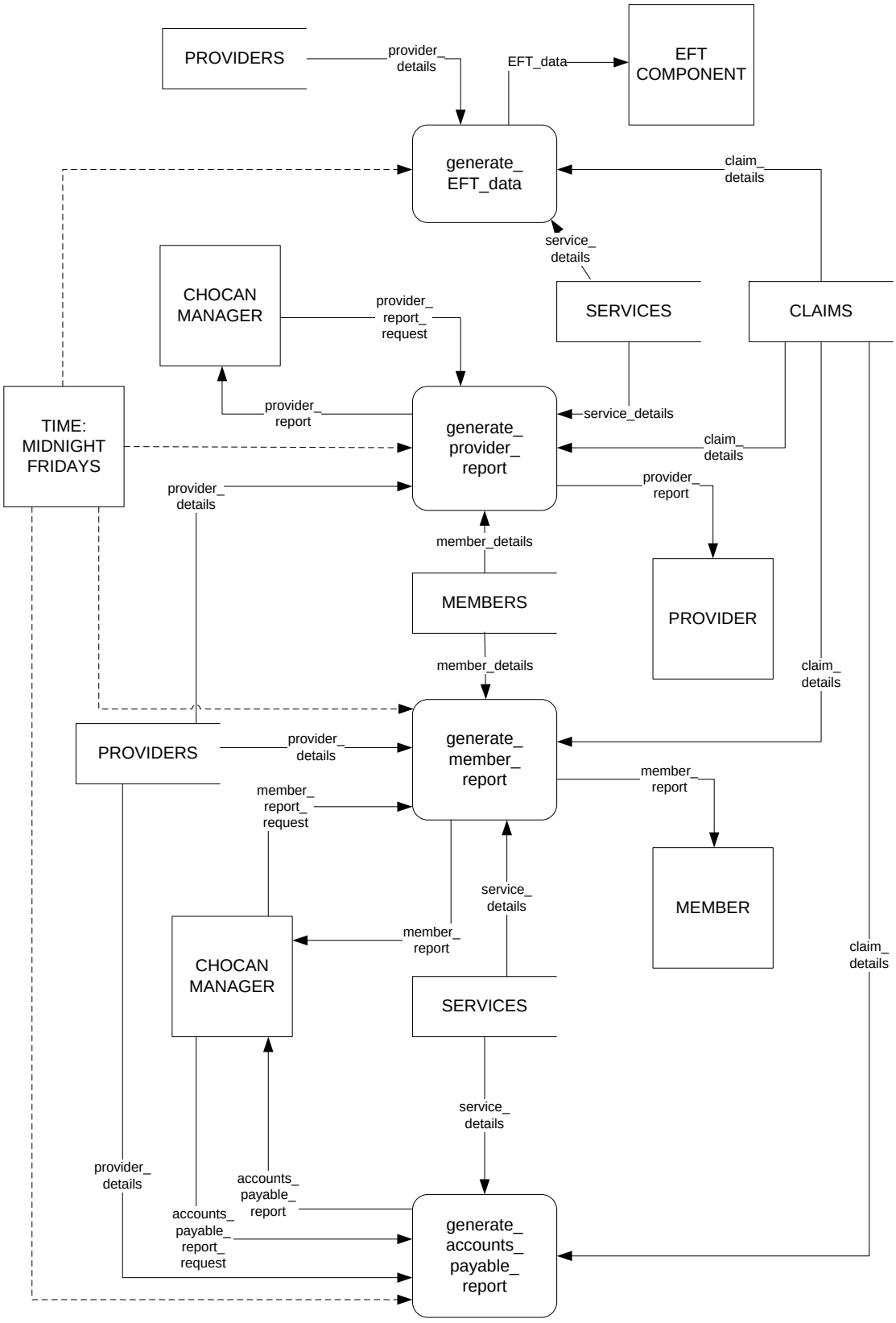
To simplify the data flow diagram, it is drawn in three parts. Data stores and external agents are repeated, but there is only one instance of each process. The data flow diagrams appear in Figures 12.7(a), 12.7(b) and 12.7(c).



Part 1 of data flow diagram for Chocoholics Anonymous.



Part 2 of data flow diagram for Chocoholics Anonymous.



Part 3 of data flow diagram for Chocoholics Anonymous.

Step 2. Decide what sections to computerize, and how.

All processes shown in the DFD will be computerized. A central database is required, installed on a server at the ChocAn Data Center. A client-server architecture is required for online implemention of the processes shown in Part 1 of the DFD (maintenance of the database by a ChocAn operator). The processes shown in Part 2 of the DFD will be implemented using provider terminals that interact with the server via a dial-up modem. The processes shown in Part 3 of the DFD will be implemented firstly as batch processes that will be run at midnight each Friday. This is indicated by the dashed lines (control flows) in the DFD. Secondly, a single report can be generated at any time interactively on request by the ChocAn manager from a client workstation.

Step 3. Put in the Details of the Data Flows

provider_details

provider number	(max 9 digits)
	(generated by system, may not be changed)
provider name	(max 25 characters)
provider street address	(max 25 characters)
provider city	(max 14 characters)
provider state	(2 letters)
provider zip code	(5 digits)
provider email address	(max 50 characters)
provider type	(1 letter, see below)

Dietitian (D), Internist (I) or Exercise Specialist (E)

provider_updates:

For a new provider:

provider details excluding provider number

To update an existing provider:

existing provider number

updated provider details excluding provider number

To delete an existing provider:

provider number

updated_provider_details:

provider_details

member_details:

member number	(max 9 digits)
	(generated by system, may not be changed)
member name	(max 25 characters)
member street address	(max 25 characters)
member city	(max 14 characters)
member state	(2 letters)
member zip code	(5 digits)
member email address	(max 50 characters)
member status	(1 letter, see below)

Active (A) or Suspended (S)

member_updates:

For a new member:

member details excluding member number

To update an existing member:

existing member number

updated member details excluding member number

To delete an existing member:

member number

updated_member_details:

member_details

service_details:

service code	(max 6 digits)
service name	(max 20 characters)
service fee	(4 + 2 digits)

service_updates:

For a new service:

service details

To update an existing service:

existing service code

updated service details

To delete an existing service:

service code

updated_service_details:

service_details

claim_details:

submission date and time	(19 characters, format MM-DD-YYYY HH:MM:SS)
service date	(10 characters, format MM-DD-YYYY)
provider number	(max 9 digits)
member number	(max 9 digits)
service code	(max 6 digits)

new_claim:
claim_details

verified_provider_number:
provider_number

verified_member_number:
member_number

verified_sevice_details:
service_details

verified_claim:
claim_details

provider_directory_request (1 character)

provider_directory:

For each service, alphabetically ordered according to service name:

service name	(max 20 characters)
service code	(max 6 digits)
service fee	(4 + 2 digits)

provider_report_request:

provider number (max 9 digits)

end date of week (10 characters, format MM-DD-YYYY)

provider_report:

provider name (max 25 characters)
provider number (max 9 digits)
provider street address (max 25 characters)
provider city (max 14 characters)
provider state (2 letters)
provider zip code (5 digits)
For each service provided, sorted according to claim submission date and time:
service date (10 characters, format MM-DD-YYYY)
submission date and time (19 characters, format MM-DD-YYYY HH:MM:SS)
member name (max 25 characters)
member number (max 9 digits)
service code (max 6 digits)
service fee (4 + 2 digits)
total number of consultations (3 digits)
total fee for week (5 + 2 digits)

member_report_request:

member number (max 9 digits)

end date of week (10 characters, format MM-DD-YYYY)

member_report:

member name (max 25 characters)
member number (max 9 digits)
member street address (max 25 characters)
member city (max 14 characters)
member state (2 letters)
member zip code (5 digits)
For each service provided, sorted according to service date:
service date (10 characters, format MM-DD-YYYY)
provider name (max 25 characters)
service name (max 20 characters)

accounts_payable_report_request:

end date of week (10 characters, format MM-DD-YYYY)

accounts_payable_report:

For each provider to be paid that week:
provider name (25 characters)
number of consultations (max 6 digits)

total fee	(5 + 2 digits)
total number of providers	(max 6 digits)
total number of consultations	(max 9 digits)
overall total fee	(6 + 2 digits)

EFT_data

For each provider to be paid:

provider name	(max 25 characters)
provider number	(max 9 digits)
total fee for week	(5 + 2 digits)

Step 4. Define Logic of Processes

maintain provider

To add a new provider:
Insert the provider details excluding provider number into the database.
The database must generate a provider number for the new provider.
To update an existing provider:
Search for the existing provider using the provider number.
Update the provider details.
To delete an existing provider:
Search for the existing provider using the provider number.
Delete the provider details.

maintain member

To add a new member:
Insert the member details excluding member number into the database.
The database must generate a member number for the new member.
To update an existing member:
Search for the existing member using the member number.
Update the member details.
To delete an existing member:
Search for the existing member using the member number.
Delete the member details.

maintain service

To add a new service:
Insert the service details into the database.
To update an existing service:
Search for the existing service using the service code
Update the service details.
To delete an existing service:
Search for the existing service using the service code
Delete the service details.

verify provider

Search for the provider number in the database.

verify member

Search for the member number in the database.
Determine if member status is Active.

process claim

Search for the service code in the database.
Insert the verified claim into the database.

generate provider directory

Extract provider directory data from database.

generate EFT data

Extract EFT data from database.

generate provider report

Extract provider report data from database.

generate member report

Extract member report data from database.

generate accounts payable report

Extract accounts payable report data from database.

Step 5. Define the data stores

PROVIDERS DATA

provider details — defined in step 3.

MEMBERS DATA

member details – defined in step 3.

SERVICES DATA

service details — defined in step 3.

CLAIMS DATA

claim details – defined in step 3.

Step 6. Define physical resources

Use a relational database with a separate table for each of the data stores defined above.

PROVIDER TABLE

Primary key: provider number

MEMBER TABLE

Primary key: member number

SERVICE TABLE

Primary key: service code

Secondary index: service name

CLAIM TABLE

Primary key: submission date and time

Foreign key: provider number

Foreign key: member number

Foreign key: service code

Secondary index: service date

Step 7. Determine input/output specifications

The content of input screens and reports and the format of fields has been determined in step 3.

Input screens will be designed for the following processes:

(ChocAn operator interface)

maintain provider
maintain member
maintain service

(ChocAn manager interface)

generate provider report
generate member report
generate accounts payable report

A command line interface (user dialogue for the provider terminal) will be designed for the following processes:

verify provider (when the terminal is switched on)
verify member
process claim
request provider directory

The layout of the following reports will be designed:

provider report

member report

accounts payable report

provider directory

The exact format of the EFT data must be determined for the following process:

generate EFT data

Step 8 . Perform Sizing

Database:

Provider table: approximately 124 to 132 bytes for each record.
ChocAn has about 100 providers currently and expects a growth of 10 percent.
Thus the provider table needs approximately 15 kilobytes of storage.

Member table: record sizes are equivalent to provider records.
ChocAn has about 1000 members currently and expects a growth of 20%.
Thus the member table needs approximately 160 kilobytes of storage.

Service table: approximately 32 bytes for each record.
There are currently about 50 different services available. Making provision for a growth of 25%, approximately 2 kilobytes of storage are required.

Claim table: approximately 52 bytes for each record.
On average, each member visits a provider twice a week. The expected number of claims per year is thus 124800. Approximately 7 megabytes are required for the claim table.

Software:

A Database Management System (DBMS) can require 10 to 500 megabytes, or more, of storage.

The application programs that must run on the server will require approximately 2 megabytes of storage. Middleware is also necessary so that the server and clients can interact. This will also require a few megabytes of storage.

Assuming a DBMS of approximately 75 megabytes, 100 megabytes of storage on the server should be sufficient. Client workstations need only enough storage to run the interface programs. This will be only a few megabytes. Provider terminals will need even less storage space because the software will include a command line interface, not a graphical user interface.

Step 9. Determine the Hardware Requirements

One server will be required for the database. At least two terminals are needed for ChocAn operators for the maintenance of data, and at least one more is needed for the manager to run reports. At least one printer will be needed for the manager to print reports. Each provider will need a provider terminal (at least 110). It is assumed that each provider will use his own computer to receive email, including provider reports and the provider directory.

The plan is for the development of the Chocoholics Anonymous software product by a software development organization consisting of three individuals: Larry the owner of the company, and two software professionals, Johnson and Pravin.

1. Overview.

1.1 Project Summary.

1.1.1 Purpose, Scope, and Objectives. The objective of this project is to develop a software product to perform data processing for Chocoholics Anonymous (ChocAn). In particular, the product must allow providers to submit claims to ChocAn using a specially designed provider terminal. ChocAn operators must be able to maintain the data, and the manager must be able to request various reports.

1.1.2 Assumptions and Constraints. Constraints include the following:

The deadline must be met.

The budget constraint must be met.

The product must be reliable.

The architecture must be open so that additional functionality may be added later.

The product must be user-friendly.

1.1.3 Project Deliverables. The complete product, including user manual, will be delivered 10 weeks after the project commences.

1.1.4 Schedule and Budget Summary. The duration, personnel requirements, and budget of each workflow are as follows:

Requirements workflow (1 week, two team members, 4,000)

Analysis workflow (2 weeks, two team members, 8,000)

Design workflow (2 weeks, two team members, 8,000)

Implementation workflow (3 weeks, three team members, 18,000)

Testing workflow (2 weeks, three team members, 12,000)

The total development time is 10 weeks and the total internal cost is 50,000.

1.2 Evolution of the Project Management Plan. All changes in the project management plan must be agreed to by Larry before they are implemented. All changes should be documented in order to keep the project management plan correct and up to date.

2. Reference Materials. All artifacts will conform to the company's programming, documentation, and testing standards.

3. Definitions and Acronyms. Chocoholics Anonymous (ChocAn); ChocAn is the client.

4. Project Organization.

4.1 External Interfaces. All the work on this project will be performed by Larry, Johnson, and Pravin. Larry will meet weekly with the client to report progress and discuss possible changes and modifications.

4.2 Internal Structure. The development team consists of Larry (owner), Johnson, and Pravin.

4.3 Roles and Responsibilities. Larry and Johnson will perform the design work-flow. Larry will design the database and construct the artifacts to maintain the data. Johnson will construct the artifacts needed for the providers to verify members and submit claims, and Pravin will develop the artifacts that handle reports. Each member is responsible for the quality of the artifacts he or she produces. Larry will oversee integration and the overall quality of the software product and will liaise with the client.

5. Managerial Process Plans.

5.1 Start-up Plan.

5.1.1 Estimation Plan. As previously stated, the total development time is estimated to be 10 weeks and the total internal cost to be $50,000. These figures were obtained by expert judgment by analogy, that is, by comparison with similar projects.

5.1.2 Staffing Plan. Larry is needed for the entire 10 weeks, for the first five weeks as manager, analyst and designer and for the second five weeks as manager, programmer and tester. Johnson is needed for the entire 10 weeks, for the first 5 weeks as systems analyst and designer, for the second 5 weeks as programmer and tester. Pravin is needed for the second five weeks as programmer and tester.

5.1.3 Resource Acquisition Plan. Other organizations are responsible for the communications software, for designing the provider's terminal, for the software needed by Acme Accounting Services and for implementing the EFT component. The server and client work stations needed by ChocAn at the Data Center are already available. The hardware, software and CASE tools required for developing the software are already available. The product will be delivered to ChocAn installed on its server and client work stations and on a prototype provider terminal.

5.1.4 Project Staff Training Plan. No additional staff training is needed for this project.

5.2 Work Plan.

5.2.1–2 Work Activities and Schedule Allocation.

Week 1.	(Completed) Met with client, determined requirements artifacts. Inspected requirements artifacts.
Weeks 2, 3.	(Completed) Produced analysis artifacts, inspected analysis artifacts. Showed artifacts to client, who approved them. Produced project management plan, inspected project management plan.
Weeks 4, 5.	Produce design artifacts, inspect design artifacts.
Weeks 6–10.	Implementation of database. Implementation and inspection of each class, unit testing and documentation, integration of each class, integration testing, product testing, documentation inspection.

5.2.3 Resource Allocation. The three team members will work separately on their assigned artifacts. Larry's assigned role will be to monitor the daily progress of the other two, oversee implementation, be responsible for overall quality, and interact with the client. Team members will meet at the end of each day and discuss problems and progress. Formal meetings with the client will be held at the end of each week to report progress and determine if any changes need to be made. Larry will ensure that

schedule and budget requirements are met. Risk management will also be Larry's responsibility.

Minimizing faults and maximizing user-friendliness will be Larry's top priorities. Larry has overall responsibility for all documentation and has to ensure that it is up to date.

5.2.4 Budget Allocation. The budget for each workflow is as follows:

Requirements workflow	4,000
Analysis workflow	8,000
Design workflow	8,000
Implementation workflow	18,000
Testing workflow	12,000
Total	50,000

5.3 Control Plan. Any major changes that affect the milestones or the budget have to be approved by Larry and documented. No outside quality assurance personnel are involved. The benefits of having someone other than the individual who carried out the development task do the testing will be accomplished by each person testing another person's work products.

Larry will be responsible for ensuring that the project is completed on time and within budget. This will be accomplished through daily meetings with the team members. At each meeting, Johnson and Pravin will present the day's progress and problems. Larry will determine whether they are progressing as expected and whether they are following the specification document and the project management plan. Any major problems faced by the team members will be reported to Larry immediately.

5.4 Risk Management Plan. The risk factors and the tracking mechanisms are as follows:

There is no existing product with which the new product can be compared. Accordingly, it will not be possible to run the product in parallel with an existing one. Therefore, the product should be subjected to extensive testing.

The client is assumed to be inexperienced with computers. Therefore, special attention should be paid to the analysis workflow and communication with the client. The product has to be made as user-friendly as possible.

Due to the ever-present possibility of a major design fault, extensive testing will be performed during the design workflow. Also, each of the team members will initially

test his or her own code then test the code of another member. Larry will be responsible for integration testing and in charge of product testing.

The information must meet the specified storage requirements and response times. This should not be a major problem because of the small size of the product, but it will be monitored by Larry throughout development.

There is a slim chance of hardware failure, in which case another machine will be leased. If there is a fault in the compiler, it will be replaced. These are covered in the warranties received from the hardware and compiler suppliers.

The provider terminal prototype may not be ready in time for testing during development. A simulation command line interface will be written to run on a personal computer. As soon as a provider terminal prototype is ready, it will be used for testing the software.

5.5 Project Close-out Plan. Not applicable here.

6 Technical Process Plans.

6.1 Process Model. The Unified Process will be used.

6.2 Methods, Tools, and Techniques. The workflows will be performed in accordance with the Unified Process. The product will be implemented in Java.

6.3 Infrastructure Plan. The product will be developed using ArgoUML running under Linux on a personal computer. MySQL will be used for the database.

6.4 Product Acceptance Plan. Acceptance of the product by our client will be achieved by following the steps of the Unified Process.

7 Supporting Process Plan

7.1 Configuration Management Plan. CVS will be used throughout for all artifacts.

7.2 Testing Plan. The testing workflow of the Unified Process will be performed.

7.3 Documentation Plan. Documentation will be produced as specified in the Unified Process.

7.4–5 Quality Assurance Plan and Reviews and Audits Plan. Johnson and Pravin will test each other's code and Pravin will test Larry's code. Larry will conduct integration testing. Extensive product testing will then be performed by all three.

7.6 Problem Resolution Plan. As stated in 5.3, any major problems faced by the team members will be reported to Larry immediately.

7.7 Subcontractor Management Plan. Not applicable here.

7.8 Process Improvement Plan. All activities will be conducted in accordance with the company plan to advance from CMM level 2 to level 3 within 2 years.

8. Additional Plans. Additional components:

Security. A provider must enter his provider number before any functions will be available on the provider terminal. Passwords will be needed to access the database. The same passwords will be needed to use the product on the client work stations. One person will be assigned as the database administrator.

Training. Training will be performed by Larry at time of delivery. Because the product is straightforward to use, 1 day should be sufficient for training. Larry will answer questions at no cost for the first year of use.

Maintenance. Corrective postdelivery maintenance will be performed by the team at no cost for a period of 12 months. In addition, a separate contract will be drawn up regarding enhancement.