Chocoholics Anonymous
(Case study adapted from Schach)

Chocoholics Anonymous (ChocAn) is an organization dedicated to helping people addicted to chocolate in all its glorious forms. Members pay a monthly fee to ChocAn. For this fee they are entitled to unlimited consultations and treatments with health care professionals, namely, dietitians, internists, and exercise experts. Every member is given a plastic card embossed with the member's name and a nine-digit member number and incorporating a magnetic strip on which that information is encoded. Each health care professional (*provider*) who provides services to ChocAn members has a specially designed ChocAn computer terminal, similar to a credit card device in a shop. When a provider's terminal is switched on, the provider is asked to enter his or her provider number.

To receive health care services from ChocAn, the member hands his or her card to the provider, who slides the card through the card reader on the terminal. The terminal then dials the ChocAn Data Center, and the ChocAn Data Center computer verifies the member number. If the number is valid, the word Validated appears on the one-line display. If the number is not valid, the reason is displayed, such as Invalid number or Member suspended; the latter message indicates that fees are owed (that is, the member has not paid membership fees for at least a month) and member status has been set to suspended.

To bill ChocAn after a health care service has been provided to the member, the provider again passes the card through the card reader or keys in the member number. When the word Validated appears, the provider keys in the date the service was provided in the format MM–DD–YYYY. The date of service is needed because hardware or other difficulties may have prevented the provider from billing ChocAn immediately after providing the service. Next, the provider uses the Provider Directory to look up the appropriate six-digit service code corresponding to the service provided. For example, 598470 is the code for a session with a dietitian, whereas 883948 is the code for an aerobics exercise session. The provider then keys in the service code. To check that the service code has been correctly looked up and keyed in, the software product then displays the name of the service corresponding to the code (up to 20 characters) and asks the provider to verify that this is indeed the service that was provided. If the provider has entered a nonexistent code, an

error message is printed. The provider also can enter comments about the service provided.

The software product now writes a record to disk that includes the following fields:

Current date and time (MM–DD–YYYY HH:MM:SS).

Date service was provided (MM–DD–YYYY).

Provider number (9 digits).

Member number (9 digits).

Service code (6 digits).

Comments (100 characters) (optional).

The software product next looks up the fee to be paid for that service and displays it on the provider's terminal. For verification purposes, the provider has a form on which to enter the current date and time, the date the service was provided, member name and number, service code, and fee to be paid. At the end of the week, the provider totals the fees to verify the amount to be paid to that provider by ChocAn for that week.

At any time, a provider can request the software product for a Provider Directory, an alphabetically ordered list of service names and corresponding service codes and fees. The Provider Directory is sent to the provider as an e-mail attachment.

At midnight on Friday, the main accounting procedure is run at the ChocAn Data Center. It reads the week's file of services provided and prints a number of reports. Each report also can be run individually at the request of a ChocAn manager at any time during the week.

Each member who has consulted a ChocAn provider during that week receives a list of services provided to that member, sorted in order of service date. The report, which is also sent as an e-mail attachment, includes:

Member name (25 characters).

Member number (9 digits).

Member street address (25 characters).

Member city (14 characters).

Member state (2 letters).

Member ZIP code (5 digits).

For each service provided, the following details are required:

Date of service (MM–DD–YYYY).

Provider name (25 characters).

Service name (20 characters).

Each provider who has billed ChocAn during that week receives a report, sent as an e-mail attachment, containing the list of services he or she provided to ChocAn members. To simplify the task of verification, the report contains the same information as that entered on the provider's form, in the order that the data were received by the computer. At the end of the report is a summary including the

number of consultations with members and the total fee for that week. That is, the fields of the report include:

> Provider name (25 characters).
> Provider number (9 digits).
> Provider street address (25 characters).
> Provider city (14 characters).
> Provider state (2 letters).
> Provider ZIP code (5 digits).
> For each service provided, the following details are required:
>> Date of service (MM–DD–YYYY).
>> Date and time data were received by the computer (MM–DD–YYYY HH:MM:SS).
>> Member name (25 characters).
>> Member number (9 digits).
>> Service code (6 digits).
>> Fee to be paid (up to $999.99).
> Total number of consultations with members (3 digits).
> Total fee for week (up to $99,999.99).

A record consisting of electronic funds transfer (EFT) data is then written to a disk; banking computers will later ensure that each provider's bank account is credited with the appropriate amount.

A summary report is given to the manager for accounts payable. The report lists every provider to be paid that week, the number of consultations each had, and his or her total fee for that week. Finally, the total number of providers who provided services, the total number of consultations, and the overall fee total are printed.

During the day, the software at the ChocAn Data Center is run in interactive mode to allow operators to add new members to ChocAn, to delete members who have resigned, and to update member records. Similarly, provider records are added, deleted, and updated.

The processing of payments of ChocAn membership fees has been contracted out to Acme Accounting Services, a third-party organization. Acme is responsible for financial procedures such as recording payments of membership fees, suspending members whose fees are overdue, and reinstating suspended members who have now paid what is owing. The Acme computer updates the relevant ChocAn Data Center computer membership records each evening at 9 P.M.

Your organization has been awarded the contract to write only the ChocAn data processing software; another organization will be responsible for the communications software, for designing the ChocAn provider's terminal, for the software needed by Acme Accounting Services, and for implementing the EFT component. The contract states that, at the acceptance test, the data from a provider's terminal must be simulated by keyboard input and data to be transmitted to a provider's terminal display must appear on the screen. A

manager's terminal must be simulated by the same keyboard and screen. Each member report must be written to its own file; the name of the file should begin with the member name, followed by the date of the report. The provider reports should be handled the same way. The Provider Directory must also be created as a file. None of the files should actually be sent as e-mail attachments. As for the EFT data, all that is required is that a file be set up containing the provider name, provider number, and the amount to be transferred.

1. Use different UML based tools like Use Case diagram to model the requirements of Chocoholics Anonymous
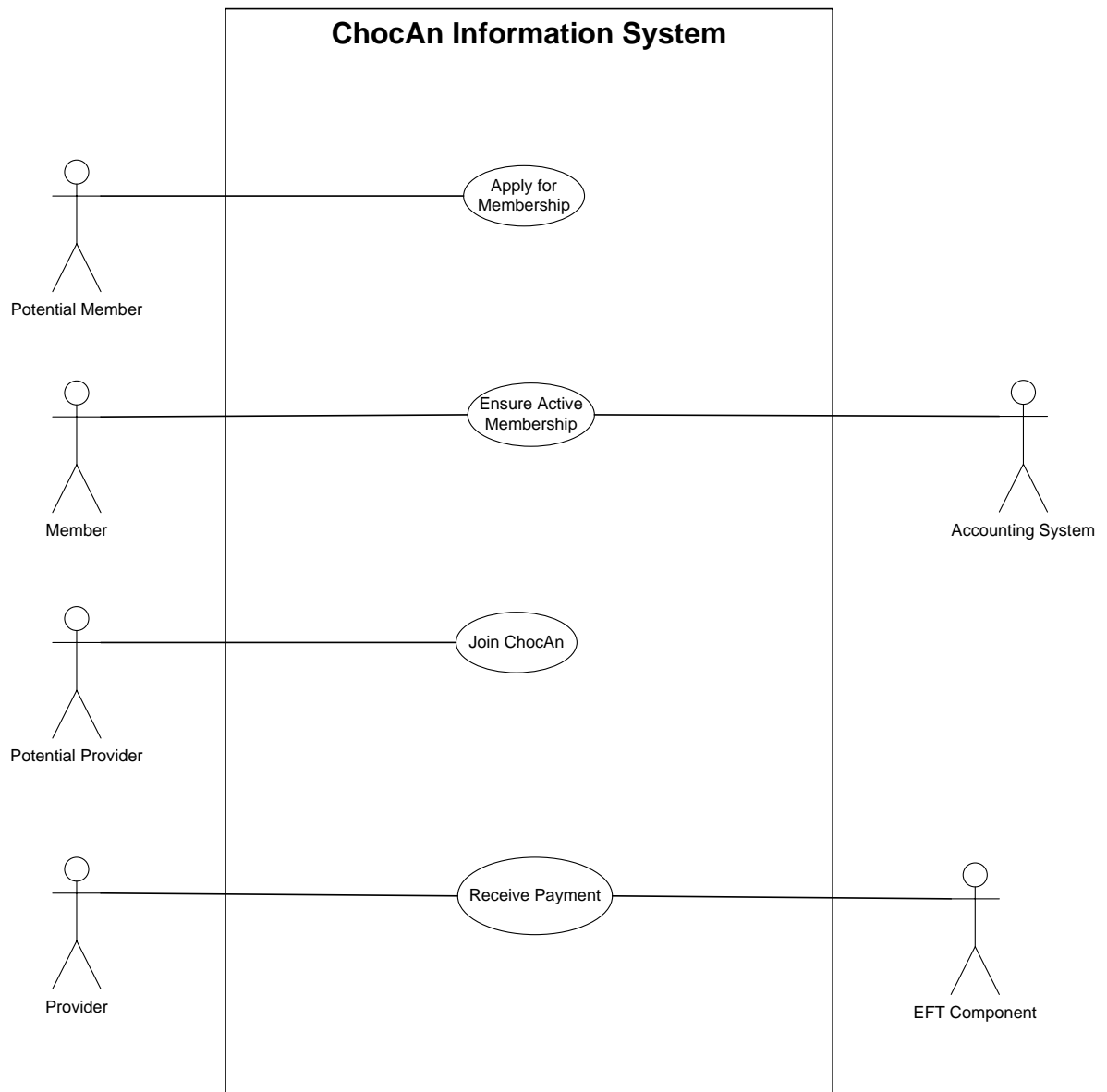2. Provide the description of each use case.

The initial glossary for Chocoholics Anonymous appears in Figure 1

Figure 2 (in four parts) shows the use-case diagrams for Chocoholics Anonymous. Figure 2 (a) shows the use cases that are part of the business model, but not part of the requirements model. Figure 2 (b) shows those use cases in which the provider is the primary system actor. Figure 2 (c) shows those use cases in which the ChocAn operator is the primary system actor. Figure 2 (d) shows the use case in which the ChocAn manager is the primary system actor, namely, to request a report, combined with the use case which is initiated by time, namely, the Accounting Procedure that is run at midnight each Friday.

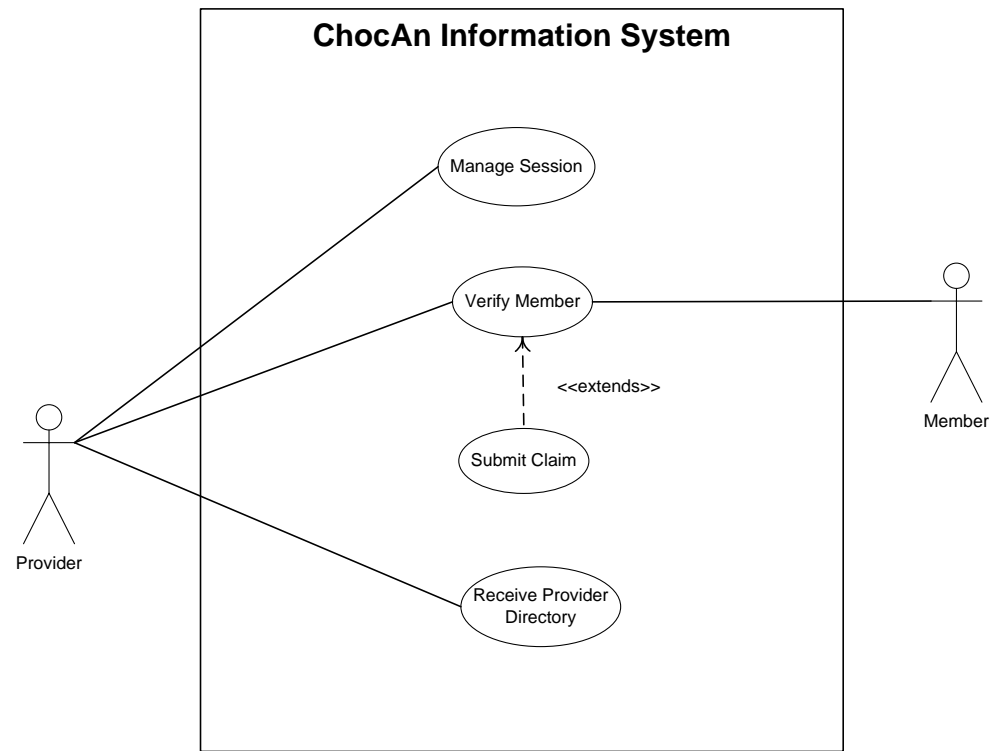| Accounts payable	Amounts of money that ChocAn must pay to providers for services rendered to ChocAn members.
Accounting procedure	Procedure that is run at midnight each Friday at the ChocAn Data Center. It produces the EFT data and various reports.
Accounting system	An information system to be developed by Acme Accounting Services. This system will be responsible for financial procedures such as recording payments of membership fees, suspending members whose fees are overdue, and reinstating suspended members who have now paid what is owed.
Addiction	An obsession, compulsion or excessive physical or psychological dependence on some substance such as chocolate.
Chocolate	A delicious food made from cacao beans. One of the most popular flavors of the world.
Chocoholics Anonymous. (ChocAn)	An organization dedicated to helping members overcome addiction to chocolate.
ChocAn data center	The building where the main computer (server) of ChocAn is housed.
ChocAn manager	A member of the staff of ChocAn, in a management position, who requires information about the services provided to members during a particular week, as well as the fees to be paid to the providers.
ChocAn operator	A member of the staff of ChocAn who has the role of maintaining the information about members and providers, i.e. adding a new member or provider, updating details and deleting a member or provider who resigns.
Claim	A request for money due to a provider for a service rendered.
Consultation	An occasion where a provider renders a service to a member of ChocAn.
Dietitian	A health-care professional who compiles a diet tailored for an individual, and monitors his or her progress.

Electronic funds transfer (EFT)	A transaction in which an amount of money is transferred from one bank account to another via the internet.
EFT data	Data to be used to transfer funds electronically from the ChocAn bank account to the providers' bank accounts.
EFT component	A component of the ChocAn Information System that will be implemented by a different organization. This component will ensure that each provider's account is credited with the appropriate amount.
Exercise specialist	A health-care professional who compiles an exercise routine tailored for an individual, and monitors his or her progress.
Internist	A health-care professional who is a medical practitioner specializing in the diagnosis, management and non-surgical treatment of illness.
Member	A person who is addicted to chocolate and has joined ChocAn to benefit from the services provided.
Member number	A 9-digit number that uniquely identifies a ChocAn member
Member status	The status of a member may be Active (the member is up to date with payments and entitled to consultations) or Suspended (the member has not paid fees for at least a month and is not entitled to consultations.)
Membership card	A plastic card embossed with the member's name and number, and incorporating a magnetic strip on which the same information is encoded.
Membership fee	A monthly amount of money that a member must pay to ChocAn to be entitled to consultations with providers.
Provider	A health-care professional who provides services to ChocAn members. Before providing a service, the provider can *verify* that the member has a valid membership card, and is not suspended. After providing a service to a member, the provider *bills* ChocAn by submitting a claim.
Provider directory	An alphabetically ordered list of service names and corresponding service codes and fees.
Provider number	A 9-digit number that uniquely identifies a ChocAn provider.
Provider terminal	A specially designed computer terminal, similar to a credit card device in a shop, incorporating a card reader that can read the magnetic strip on a member's card, a keyboard, and a one-line display.
Provider type	The type of a provider, namely dietician, internist or exercise specialist.
Scheduler	The mechanism that ensures that the accounting procedure is run at set times. The set times are currently midnight on Fridays.
Service	A classification of a treatment, consultation or session with a provider, e.g. an aerobics exercise session.
Service code	A 6-digit code that uniquely identifies a service.
Treatment	A synonym for consultation.

Figure 1. Initial glossary for Chocoholics Anonymous.

ChocAn Information System

Apply for Membership

Potential Member

Ensure Active Membership

Member

Accounting System

Join ChocAn

Potential Provider

Receive Payment

Provider

EFT Component

Use Case Diagram
Part 1

Figure 2 (a). Part 1 of Chocoholics Anonymous use-case diagram.

ChocAn Information System

Manage Session

Verify Member

<<extends>>

Submit Claim

Receive Provider
Directory

Provider

Member

Use Case Diagram
Part 2

Figure 2 (b). Part 2 of Chocoholics Anonymous use-case diagram.

ChocAn Information System

Member

Provider

Manager

Maintain Member

Maintain Provider
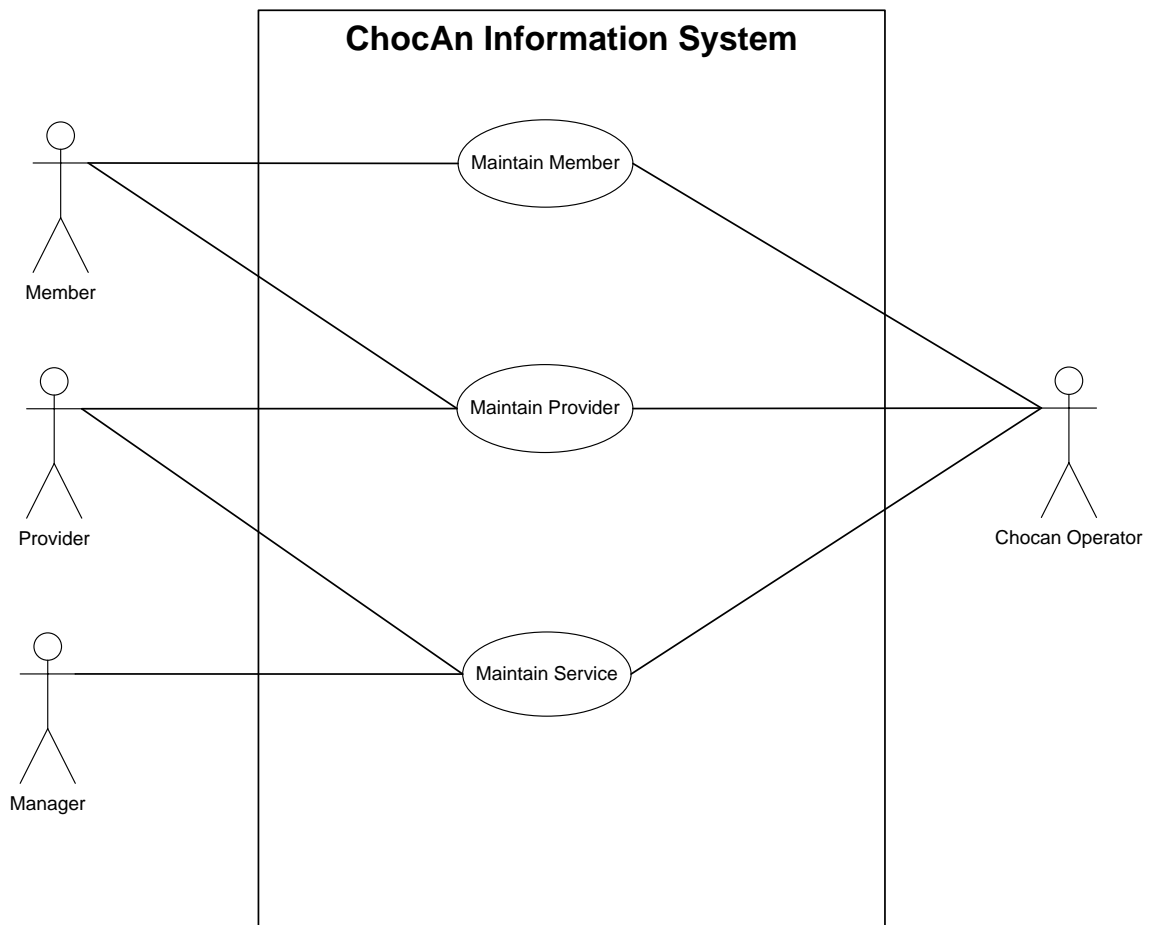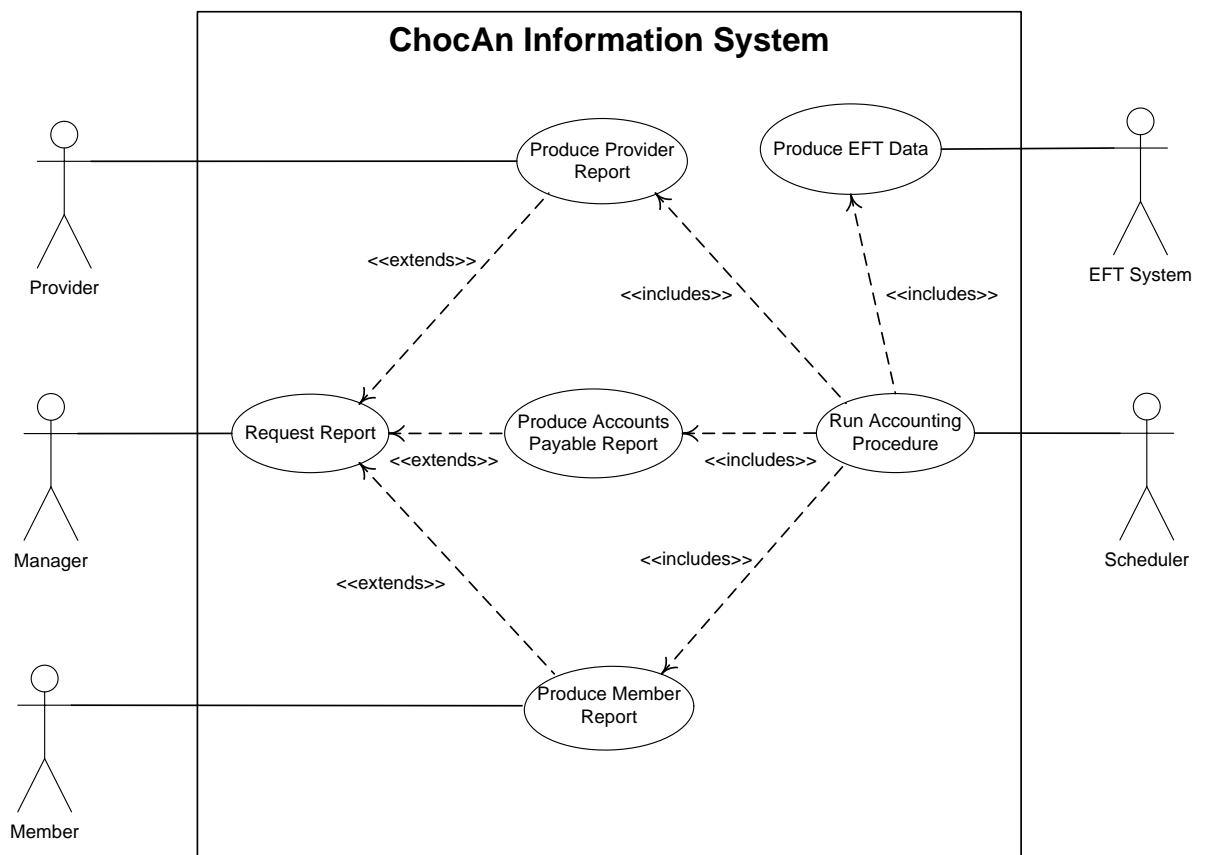
Maintain Service

Chocan Operator

Use Case Diagram
Part 3

Figure 2 (c). Part 3 of Chocoholics Anonymous use-case diagram.

Use Case Diagram
Part 4
Figure 2 (d). Part 4 of Chocoholics Anonymous use-case diagram.

Brief Description:

The `Apply for membership` use case enables a potential member to become a member of Chocoholics Anonymous.

Step-by-Step Description:

1. The potential member fills in an application form and submits it to Chocoholics Anonymous.

2. The staff member responsible for screening applicants decides, using ChocAn business rules, whether the potential member should be accepted as a member.

3. The staff member informs the potential member of the decision, and if the potential member was accepted, the staff member requests him to pay the monthly fee for the first month.

4. The new member pays the fee for the first month.

   A ChocAn operator now uses the Maintain Member use case to record the new member's details and allocate a member number to him.

5. A staff member prints a membership card for the new member and sends the card to him.

   The new member is now entitled to unlimited consultations and treatments with ChocAn providers.

Figure 3. Description of the `Apply for Membership` use case.

Brief Description:

The `Ensure Active Membership` use case enables a member to continue to be an active member of Chocoholics Anonymous by paying the monthly fee.

Step-by-Step Description:

1. The member submits the payment of the monthly fee to Chocoholics Anonymous.

2. The staff member responsible for payments uses the Accounting System to record the payment and send a receipt to the member.

3. The Accounting System updates the member's status to Active.

Figure 4 Description of the `Make Payment` use case.

Brief Description:
The `Join ChocAn` use case enables a potential provider to join ChocAn.
Step-by-Step Description:
1. The potential provider submits all required information to ChocAn. 2. A staff member responsible for screening providers decides, using ChocAn business rules, whether the provider should be accepted as a ChocAn approved provider. 3. The staff member informs the potential provider of the decision. A ChocAn operator now uses the Maintain Provider use case to record the new provider's details and allocate a provider number to him. 4. A staff member supplies the provider with a provider terminal and his or her provider number. The new provider may now provide services for ChocAn members and bill ChocAn for those services.

Figure 5. Description of the `Join ChocAn` use case.

Brief Description:
The `Receive Payment` use case enables the provider to receive payment for services provided to ChocAn members.
Step-by-Step Description:
1. At the end of each week, the EFT component transfers the money claimed by a provider during that week into the provider's account.

Figure 6. Description of the `Receive Payment` use case.

Brief Description:

The `Manage Session` use case enables the provider to log on to the ChocAn system, use the various functions available to him and log off again.

Step-by-Step Description:

1.	When the provider switches his provider terminal on, the system prompts him to enter his provider number.

2.	The provider supplies his provider number.

3.	The system searches for this provider number.

4.	The system displays the result of the search.

4.1	If no such provider is found, the system displays an `Invalid Number` message.

4.2	If the provider is found, the system displays the options available to the provider.

The provider can now use the system as in use cases `Verify Member` and `Receive Provider Directory`.

5.	When the provider chooses the Quit option or switches the terminal off, the system ends the session.

Figure 7. Description of the `Manage Session` use case.

Brief Description:

The `Verify Member` use case enables a provider to verify that a member has a valid member number and that the member is not suspended.

Step-by-Step Description:

The provider must have already switched on his or her terminal and entered his or her provider number correctly.

1.	The provider swipes the member's card through the card reader of the provider terminal, or keys in the member number (when the claim is submitted at a later date or time).

2.	The system searches for a member with this number.

3.	The system displays the result of the verification.

3.1	If no such member is found, the system displays an `Invalid number` message.

3.2.	If the member is found, the system displays a message indicating the status of the member e.g. `Suspended` if the member is suspended or `Validated` if the member is active.

Figure 8 Description of the `Verify Member` use case.

Brief Description:
The `Submit Claim` use case enables a provider to bill Chocoholics Anonymous for a service provided to a member.
Step-by-Step Description:
After a provider has verified a member, the message `Validated` appears on the provider's terminal, and the provider can continue to submit a claim.
1. The provider enters the date the service was provided in the format MM-DD-YYYY and the service code.
2. The system verifies that the service code exists. If it does, the system displays the corresponding service name.
3. The provider confirms that this is the correct service rendered.
4. The system stores the following information about the claim submitted:
Current date and time (MM-DD-YYYY HH:MM:SS)
Service date (MM-DD-YYYY)
Provider number (max 9 digits)
Member number (max 9 digits)
Service code (max 6 digits)
5. The system displays the fee to be paid to the provider for the service rendered.
The provider has a form on which he or she can enter the same information as that stored by the system, as well as the service fee.

Figure 9. Description of the `Submit Claim` use case.

Brief Description:
The `Receive Provider Directory` use case enables a provider to request and receive a copy of the Provider Directory.
Step-by-Step Description:
The provider must have already switched on his or her terminal and entered his or her provider number correctly.
1. The provider submits a request for a Provider Directory through his or her terminal.
2. The system generates a list (report) of all services, ordered alphabetically according to the service name, including, for each service: Service name (max 20 characters) Service code (max 6 digits) Service fee (max $999.99)
3. The system sends the list as an email attachment to the provider, and displays a message to this effect on the provider's terminal.

Figure 10. Description of the `Receive Provider Directory` use case.

Brief Description:

The `Maintain member` use case enables a ChocAn operator to add new members, update the details of existing members and delete members who have resigned.

Step-by-Step Description:

To add a new member:

> When a potential member's application for membership has been approved and he or she has paid the first month's fee, his or her details are forwarded to the ChocAn operator.

1. The ChocAn operator selects the option to add a new member, and enters the new member's details:
   > 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)

2. The system allocates a number for the new member, records the new member's details, and sets the new member's status to Active.

3. The system displays the new member's member number and other details.

To update an existing member:

> When a member's details have changed, the member submits his or her new details to ChocAn.

1. The ChocAn operator finds the existing member details.

2. The ChocAn operator edits the details that must be changed. (The member number can never be changed.)

3. The system updates the member's details.

To delete an existing member:

> When a member wants to resign, he or she informs ChocAn.

1. The ChocAn operator finds the existing member details.

2. The ChocAn operator selects the option to delete the member.

3. The system records the member's resignation and deletes the member's details at the end of the week, after the accounting procedure has been run.

Figure 11 Description of the `Maintain Member` use case.

Brief Description:
The `Maintain Provider` enables a ChocAn operator to add new providers, update the details of existing providers and delete providers who have resigned.
Step-by-Step Description:
To add a new provider:
When a new provider joins ChocAn, his or her details are forwarded to the ChocAn operator.
1.   The ChocAn operator selects the option to add a new provider, and enters the new provider's details:
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 (Dietitian, Internist or Exercise Specialist)
2.   The system allocates a number for the new provider and records the new provider's details.
3.   The system displays the new provider's provider number and other details.
4   The system sends emails to all members informing them of the new provider.
To update an existing provider:
When a provider's details have changed, the provider submits his or her new details to ChocAn.
1.   The ChocAn operator finds the existing provider details.
2.   The ChocAn operator edits the details that must be changed. (The provider number can never be changed.)
3.   The system updates the provider's details. The system sends emails to all members informing them of the changes.
To delete an existing provider:
When a provider wants to resign, he or she informs ChocAn.
1.   The ChocAn operator finds the existing provider details.
2.   The ChocAn operator selects the option to delete the provider.
3.   The system records the provider's resignation and deletes the provider's details at the end of the week, after the accounting procedure has been run. The system sends emails to all members informing them of the provider's resignation.

Figure 12. Description of the `Maintain Provider` use case.

Brief Description: The `Maintain Service` use case enables the ChocAn operator to add new services, update details of existing services and delete services that are discontinued.

Step-by-Step Description:
 	
The details of new, changed or discontinued services are given to the ChocAn operator by the ChocAn manager.
 	
To add a new service:
 	
1.   The ChocAn operator selects the option to add a new service, and enters the new service's details:
                Service code (max 6 digits)
                Service name (max 20 characters)
                Service fee (max $999.99)
 	
2.   The system records the new service details.
 	
3.   The system displays the new service details.
 	
4.   The system sends emails to all providers informing them of the new service.
 	
To update an existing service:
 	
1.   The ChocAn operator finds the existing service details.
 	
2.   The ChocAn operator edits the details that must be changed.
 	
3.   The system updates the service details. The system sends emails to all providers informing them of the changes.
 	
To delete an existing service:
 	
1.   The ChocAn operator finds the existing service details.
 	
2.   The ChocAn operator selects the option to delete the service.
 	
3.   The system records the discontinuation of the service and deletes the service details at the end of the week, after the accounting procedure has been run. The system sends emails to all the providers informing them of the discontinuation of the service.

Figure 13. Description of the `Maintain Service` use case.

Brief Description:	
The `Request Report` use case enables the ChocAn manager to request a member report, a provider report or an accounts payable report.	

Step-by-Step Description:	
1.	The ChocAn manager selects the report that he or she requires, and enters the end date of the week he or she requires.
2.1	For a member report, the manager enters the member number. The system generates a member report using the `Produce a Member Report` use case.
2.2	For a provider report, the manager enters the provider number. The system generates a provider report using the `Produce a Provider Report` use case.
2.3	The system generates an accounts payable report using the `Produce an Accounts Payable Report` use case.
3.	The manager can choose to print the report.
4.	If required, the system prints the report.

Figure 14 Description of the `Request Report` use case.

Brief Description:	
The `Run Accounting Procedure` use case enables the Scheduler to run the accounting procedure so that members, providers and the ChocAn manager receive weekly reports. The use case also enables providers to receive the fees due to them by providing the EFT component with the EFT data.	

Step-by-Step Description:	
	This procedure is run every week at midnight on Friday.
1.	For each provider, the system generates a report using use case `Produce a Provider Report`, and sends the report as an email attachment to the provider.
2.	For each member, the system generates a report using use case `Produce a Member Report`, and sends the report as an email attachment to the member.
3.	The system generates an accounts payable report for the ChocAn manager using the use case `Produce an Accounts Payable Report`, and sends the report to the manager as an email attachment.
4.	The system produces the EFT data for the EFT component using the use case `Produce EFT Data`.

Figure 15. Description of the `Run Accounting Procedure` use case.

Brief Description:
The `Produce Provider Report` use case enables the system to generate a report of all claims submitted during a specific week by a particular provider.

Step-by-Step Description:
 	
1.   The system generates the provider report including the following information:
        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, the following information, sorted according to claim submission date and time, is included:
            Service date (MM-DD-YYYY)
            Claim submission date and time (MM-DD-YYYY HH:MM:SS)
            Member name (max 25 characters)
            Member number (max 9 digits)
            Service code (max 6 digits)
            Service fee (max $999.99)
        Total number of consultations with members (3 digits)
        Total fee for week (max $99,999.99)

Figure 16 Description of the `Produce Provider Report` use case.

Brief Description:
The `Produce EFT Data` use case enables the system to generate a file containing the current week's EFT data for the EFT component.

Step-by-Step Description:
 	
1.   The system writes to a file the following data for each provider who must be paid, for the week:
        Provider name (max 25 characters)
        Provider number (max 9 digits)
        Total fee for week (max $99,999.99)

Figure 17. Description of the `Produce EFT Data` use case.

Brief Description:

The `Produce Accounts Payable Report` use case enables the system to generate a summary report of all services rendered by ChocAn providers, and the fees due to them, during a specific week.

Step-by-Step Description:

1. The system generates the accounts payable report including the following information:
   For each provider to be paid that week:
   Provider name (25 characters)
   Number of consultations (max 6 digits)
   Total fee (max $99,999.99)
   Total number of providers who provided services (max 6 digits)
   Total number of consultations (max 9 digits)
   Overall total fee (max $999, 999.99)

Figure 18. Description of the `Produce Accounts Payable Report` use case.

Brief Description:

The `Produce Member Report` use case enables the system to generate a report of all services rendered to a particular member during a specific week.

Step-by-Step Description:

1. The system generates the member report including the following information:
   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, the following information, sorted according to service date, is included:
   Service date (MM-DD-YYYY)
   Provider name (max 25 characters)
   Service name (max 20 characters)

Figure 19. Description of the `Produce Member Report` use case.