

CMPT 354 Mini Project Report

Step 2: Project Specifications

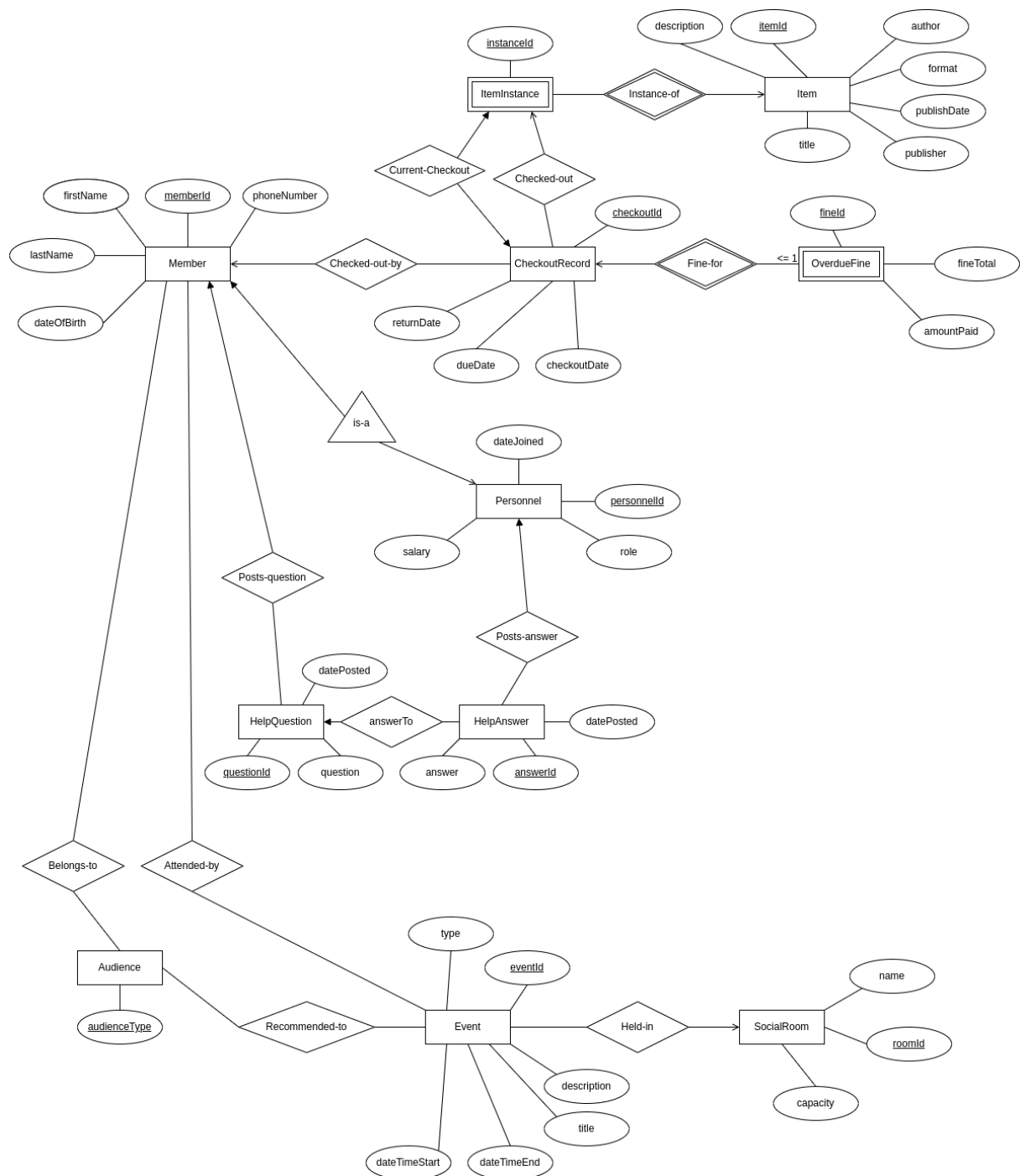
Provided Specifications

- Library has print books, online books, magazines, scientific journals, CDs, records, etc.
- People can borrow the items from the library and return by the due date.
- People may be subject to fines if they do not return items by the due date.
- Library also holds book clubs, book related events, art shows, film screenings, etc.
- Library events are recommended for specific audiences.
- Library events are held in library social rooms.
- People can attend library events for free.
- Library also has personnel and record keeping for personnel.
- Library also keeps records of items (books, etc.) that might be added to the library in the future.

Additional Specifications:

- The Library can stock multiple copies of a particular physical item.
- People can borrow multiple items at once.
- People can borrow new items before returning their previously borrowed items as long as no items currently borrowed by that person are overdue.
- People cannot borrow new items if they have outstanding fines.
- A particular physical item can be borrowed again after being returned, but it cannot be checked out by anyone if it is currently being borrowed.
- Digital items can be accessed any number of times consecutively as they do not have physical copies.
- Library records the history of items borrowed by members.
- Library keeps track of event attendance history of members.
- Library keeps track of overdue fines for members, and whether they have been paid.
- Only one event can be held in a social room at a time.
- Social rooms have a capacity, so only a limited number of people can attend a specific event.
- Overdue fines scale with each day past the due date, up to a maximum of \$100.
- Overdue fines are issued upon the return of an overdue item.
- Only one fine may be issued per instance of a borrowed item that is returned late.
- All library personnel have library memberships.
- Members can volunteer at the library.
- Members can post questions in a help forum, and personnel can submit answers to those questions. There can be multiple answers submitted to a particular question.

Step 3: E/R Diagram



Step 4: Does Your Design Allow Anomalies

Relational Model (Schema):

Member = { memberId, firstName, lastName, dateOfBirth, phoneNumber }

Personnel = { personnelId, memberId^{FK-Member}, role, dateJoined, salary }

Item = { itemId, title, author, format, publishDate, publisher }
 ItemInstance = { instanceld, itemId^{FK-Item}, currentCheckoutId^{FK-CheckoutRecord} }
 CheckoutRecord = { checkoutId, memberId^{FK-Member}, itemId^{FK-ItemInstance}, instanceld^{FK-ItemInstance},
 checkoutDate, dueDate, returnDate }
 OverdueFine = { fineId, checkoutId^{FK-CheckoutRecord}, fineTotal, amountPaid }
 Event = { eventId, title, description, type, dateTimeStart, dateTimeEnd, roomId^{FK-SocialRoom} }
 SocialRoom = { roomId, name, capacity }
 Audience = { audienceType }
 EventRecommendation = { eventId^{FK-Event}, audienceType^{FK-Audience} }
 MemberAudienceType = { memberId^{FK-Member}, audienceType^{FK-Audience} }
 EventAttendance = { eventId^{FK-Event}, memberId^{FK-Member} }
 HelpQuestion = { questionId, memberId^{FK-Member}, question, datePosted }
 HelpAnswer = { answerId, personnelId^{FK-Personnel}, answer, datePosted }

Functional Dependencies:

Member:

$C_{\Sigma}(\text{memberId}) \rightarrow \{ \text{memberId}, \text{firstName}, \text{lastName}, \text{dateOfBirth}, \text{phoneNumber} \}$

Personnel:

$C_{\Sigma}(\text{personnelId}) = \{ \text{personnelId}, \text{memberId}, \text{role}, \text{dateJoined}, \text{salary} \}$

Item:

$C_{\Sigma}(\text{itemId}) = \{ \text{itemId}, \text{title}, \text{author}, \text{format}, \text{publishDate}, \text{publisher} \}$

ItemInstance:

$C_{\Sigma}(\text{instanceld}, \text{itemId}) = \{ \text{instanceld}, \text{itemId}, \text{currentCheckoutId} \}$

CheckoutRecord:

$C_{\Sigma}(\text{checkoutId}) = \{ \text{checkoutId}, \text{memberId}, \text{itemId}, \text{instanceld}, \text{checkoutDate}, \text{dueDate}, \text{returnDate} \}$

OverdueFine:

$C_{\Sigma}(\text{fineId}) = \{ \text{fineId}, \text{checkoutId}, \text{fineTotal}, \text{amountPaid} \}$

Event:

$C_{\Sigma}(\text{eventId}) = \{ \text{eventId}, \text{title}, \text{description}, \text{type}, \text{dateTimeStart}, \text{dateTimeEnd}, \text{roomId} \}$

SocialRoom:

$C_{\Sigma}(\text{roomId}) = \{ \text{roomId}, \text{name}, \text{capacity} \}$

Audience:

$C_{\Sigma}(\text{audienceType}) = \{ \text{audienceType} \}$

EventRecommendation:

$C_{\Sigma}(\text{eventId}, \text{audienceType}) = \{ \text{eventId}, \text{audienceType} \}$

MemberAudienceType:

$C_{\Sigma}(\text{memberId}, \text{audienceType}) = \{ \text{memberId}, \text{audienceType} \}$

EventAttendance:

$C_{\Sigma}(\text{eventId}, \text{memberId}) = \{ \text{eventId}, \text{memberId} \}$

All Relations are in BCNF.