

# FINAL E-R DIAGRAM

P3. Changes to Initial ERD.

Based on professor's feedback, following changes were made to the initial ER diagram to normalize the database entities, and introduce associative entities wherever required.

1. The attribute '**Search Criteria**' was removed as the search patterns are not being stored in the system. The '**Book Search**' relationship is transformed into an associative entity with a composite primary key **Book ID** and **Person ID**.
2. The relationship '**Uses**' in the initial ERD was changed to an associative entity '**Print**' thus helping the system record the document details (Name and Type), Number of Pages, Date and Time information.
3. **PRINT** is assigned a composite primary key **Person ID** and **Model No**, which in turn, are the foreign keys that reference the associated relations.
4. The supertype/subtype relationship between PERSON, LIBRARIAN, and MEMBER was changed as follows – PERSON is a supertype of MEMBER and AUTHOR. MEMBER is a supertype of READER and LIBRARIAN. The updated hierarchy supports the following business rule –  
  
"A person must either be a member or an author. A member in turn must either be a librarian or a reader. There are no other types of persons in LMS."
5. The relationship '**Publishes**' between BOOK and AUTHOR was transformed into an associative entity with a composite primary key **Book ID** and **Author ID**.
6. The '**Book**' relationship between ROOM and READER was also transformed into an associative entity to record the room booking details like Date and Time.
7. The associative entity '**Booking**' is assigned a composite primary key **Reader ID** and **Room No**, which in turn, are the foreign keys that reference the associated relations.
8. The business rule is added to state the following – "A librarian may issue none, one, or many library cards. A library card must be issued by only 1 librarian."
9. In PERSON entity, the composite attributes **Address** (Address, City, State, Postal Code) was changed into multiple single valued attributes.
10. In BOOK entity, the multivalued attribute {Copies} was removed and all the copies will be treated as a separate instance of the BOOK entity.
11. Primary and Foreign keys were added to each of the database entities and the database was normalized to 3NF to remove any multivalued or composite attributes.