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TECHNOLOGY

UNIVERSITY OF
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Database Systems

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Individual Coursework: Part A - EERD

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Business Questions



The screenshot shows a forum post on a light purple background. At the top left is a circular profile picture of a person. To its right, the name 'Baminahannadige Fernando' is displayed in bold, followed by 'a few seconds ago, at 12:51'. Further right is a three-dot menu icon. Below the name, the text 'Name : Oshadha Fernando' is shown. Underneath that are two lines of text: 'UoW ID:2052726' and 'IIT ID :20220857'. The main body of the post contains five numbered questions, each followed by a bullet point answer.

Baminahannadige Fernando
a few seconds ago, at 12:51
Name : Oshadha Fernando
UoW ID:2052726
IIT ID :20220857

- 1) A player must select a sport at registration, or is it possible for a player to be registered without selecting a specific sports ?
 - A player must select at least one sport at registration. Every player in the Racket minster scheme is required to be associated with a specific sport, either tennis or pickle ball
- 2) Is it possible to hold multiple sessions on a single court at the same time ?
 - Yes multiple sessions can be conducted on the same court at the same time
- 3) Is an Instructor able to conduct more than one session at the same time ?
 - No, an instructor can only conduct one session at time
- 4) Can a player recommend multiple players to the scheme and receive a discount for each recommendations ?
 - Yes, one player can recommend multiple players to the scheme and receive a discount for each recommendation.
- 5) Can one piece of equipment be used in more than one court ?
 - Answer: No, each piece of equipment is unique to one court because of their availability and appropriate maintenance .

Figure 1 Business Questions

1. Questions & Answers Forum (Q&A Forum)

- 1) A player must select a sport at registration, or is it possible for a player to be registered without selecting specific sports?
 - A player must select at least one sport at registration. Every player in the Racket minster scheme is required to be associated with a specific sport, either tennis or pickle ball
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 - Answer: No, each piece of equipment is unique to one court because of their availability and appropriate maintenance .

QUESTION 1: CRITICAL EVALUATION AND REFLECTIVE COMMENTARY

1.1 CRITICAL EVALUATION

Critical Evaluation of the Provided EERD

The Enhanced Entity-Relationship Diagram (EERD) in Document A.2 has a number of significant faults especially with regard to its general conceptual design and semantics. Important concerns include:

1. Unclear and Incomplete Relationships

- **Lack of Multiplicity Clarity:** The conceptual framework of the diagram is unclear since relationships like Supervises and Maintains do not define cardinalities.
- **Vague or Redundant Relationships:** Relationships like “Recommends” have an uncertain goal and scope, which adds needless complexity.

2. Flawed Attribute Placement

- **Improperly Assigned Attributes:** The improper distribution of attributes such as “Status” among entities results in functional overlaps.
- **Missing Key Attributes:** The lack of essential characteristics like Session_Duration and Booking_Type restricts the model's capacity to represent actual situations.

3. Primary Key and Foreign Key Mismanagement

- **Weak Key Definitions:** Data associations become unclear when primary and foreign keys are used inconsistently, as is the case with entities like Booking.
- **Unnecessary Composite Keys:** Overuse of composite keys, particularly in Block_Booking, adds complexity to the design without providing a convincing argument.

4. Entity Design and Specialization Issues

- **Lack of Generalization:** Redundancy results from the diagram's lack of a universal Person entity to express shared properties for the Player, Caretaker, and Instructor.

- **Overlapping Entities:** Although the functions of entities like Session and Booking are similar, it is unclear what their specific duties are.

5. Semantic Weaknesses

- The conceptual model seems disconnected and inconsistent as a result of the overall diagram's disorganization in depicting actual operations.

Reflective Commentary: Approach to an Improved Conceptual EERD

To address these deficiencies, a structured approach is essential for producing a coherent and semantically accurate EERD.

1. Entity Design

- The Player, Court, Session, and Caretaker core entities have been carefully evaluated and improved. Where appropriate, specialization was used, such as categorizing sessions into several categories (such as Social_Play and Fitness_Training) to better represent real-world situations.

2. Relationship Refinement

- **Define Clear Multiplicities:** Indicate the cardinalities for each relationship, such as 1..n for the caretaker maintaining courts and 1..n for the instructor monitoring sessions.
- **Simplify and Clarify:** Redefine relationships to prevent duplication; for example, combine Block_Booking with a distinguishing attribute under Booking.

3. Use of Generalization

- **Introduce a Generalized Person Entity:** With specializations for role-specific information, combine the shared characteristics of the Player, Caretaker, and Instructor into a Person entity.

4. Optimization and Clarity

- **Logical Layout:** Arrange entities and connections in a visually straightforward manner, eliminating overlapping lines and excessive complexity.

- **Remove Redundant Entities:** Eliminate entities or properties that do not offer value, guaranteeing a lean and functional design.

5. Scalability and Practicality

- The design ensures changes without sacrificing current structures by predicting future requirements, such as the inclusion of new session types or more information for players and reservations.

Justification for the Improved Design

The original EERD's structural and conceptual mistakes are the main emphasis of this updated method. Through attribute alignment, connection simplification, and generalization when needed, the enhanced design improves scalability, clarity, and usability. It guarantees that the model follows best standards for conceptual modelling, is logically clear, and can handle complex operations.

QUESTION 2: ENTITIES

Entity name	Brief Explanation
w2052726_Park	A park is a designated outdoor area within the town of Ovestminster that hosts various courts
w2052726_Court	A court is a location where players can engage in their preferred sport, such as Pickleball or Tennis.
W2052726_Player	A player is an individual registered with the Racketminster scheme who can book sessions to play racket sports and may recommend the scheme to other players.
W2052726_Sport	A sport represents a specific racket-based activity offered within the Racketminster scheme, such as Tennis or Pickleball, that players can participate in
w2052726_Equipment	Every court has specific equipment assigned to it, which is usually either fixed or moveable and includes things like netting, rackets, balls, etc.
w2052726_Staff	Staff members are individuals employed under the Racketminster scheme who play specific roles to maintain parks and facilitate sessions for players. Staff includes both caretakers and instructors.
w2052726_Session	A session is a scheduled time slot where players can participate in a racket sport. Sessions can be supervised or unsupervised, with supervised sessions including personal training, group coaching, or social-fun activities.
w2052726_Booking	A booking is a reservation made by a player to participate in a specific session, either supervised or unsupervised. Bookings ensure the player has access to the court and equipment for the session.
W2052726_Blockbooking	A block booking allows a player to reserve multiple

	consecutive unsupervised sessions in advance, facilitating continuous session play and traceability between sessions.
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Table 1 Entity Table

QUESTION 3: SPECIALISATIONS

W2052726_Court

General Entity	Specialized Entity	Brief Explanation
w2052726_Court	w2052726_TennisCourt	According to the description, these parks have a variety of courts, with tennis courts being one of the more specialized types. a tennis court with unique equipment and design.
	w2052726_PickleballCourt	The description shows that pickleball court is also considered as one kind of court. A court specially designed and equipped for tennis.

Table 2 Specialisation court table

W2052726_Sport

General Entity	Specialized Entity	Brief Explanation
w2052726_Sport	w2052726_Tennis	Tennis is a specialized racket-based sport within the Racket minster scheme, played on courts exclusively designed or adapted for tennis. Tennis sessions involve specialized equipment and follow specific rules for singles or doubles play, creating a unique sporting experience.
	w2052726_Pickleball	Pickleball is a specialized racket-based sport

		available in Racketminster, played on dedicated pickleball courts or adaptable spaces. With distinct equipment such as paddles and pickleball-specific rules, the sport offers players a unique blend of racket sport elements, combining aspects of tennis, badminton, and table tennis.
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Table 3 Specialisation sport table

W2052726_Equipment

General Entity	Specialized Entity	Brief Explanation
w2052726_Equipmentt	w2052726_Fixed	Fixed equipment includes items permanently installed on or around the court, such as nets or boundary markers, which are essential for the setup and structure of each court. This type of equipment remains in place and is maintained regularly to ensure court readiness and functionality.
	w2052726_Movble	Movable equipment refers to portable items that players or staff can move as needed, such as rackets, balls, and paddles. This type of equipment is stored securely when not in use and can be easily transported to support different playing sessions and activities.

Table 4 Specialisation equipment table

W2052726_Staff

General Entity	Specialized Entity	Brief Explanation
w2052726_Staff	w2052726_Caretacker	A caretaker is a specialized staff member responsible for the upkeep and preservation of parks and courts. Caretakers ensure that facilities and equipment are maintained to high standards, performing regular maintenance and repairs as needed to keep the playing environment safe and well-prepared for use.
	w2052726_Instructor	An instructor is a specialized staff member focused on player engagement and guidance. Instructors lead and oversee supervised sessions, providing expertise in training, group coaching, and social-fun activities. Their role is to enhance the players' experience through skilled instruction and support.

Table 5 Specialisation staff table

W2052726_Session

General Entity	Specialized Entity	Brief Explanation
w2052726_Session	w2052726_Supervised	A supervised session is a specialized session guided by an instructor. These sessions include personal training, structured group coaching, or social-fun activities, ensuring players receive expert guidance and support.

		Supervised sessions offer a structured environment where players can enhance their skills and engage in a more social or educational setting.
	w2052726_Unsupervised	An unsupervised session is a specialized session allowing players to play independently, without direct oversight from an instructor. These sessions typically support singles or doubles play, enabling players to enjoy more flexibility and autonomy.

Table 6 Specialisation session table

W2052726_Unsupervised

General Entity	Specialized Entity	Brief Explanation
w2052726_Unsupervised	w2052726_Single	A single session involves two players competing against each other in a one-on-one format. This specialized setup allows players to focus on their individual skills, strategies, and gameplay in a more personal and competitive environment
	w2052726_Double	A double session involves four players divided into two teams, each consisting of two players. This specialized format fosters teamwork and collaboration, allowing players to engage in a more dynamic and social experience. Doubles play often emphasizes strategy and communication, enhancing the overall enjoyment of the game.

Table 7 Specialisation unsupervised table

W2052726_Supervised

General Entity	Specialized Entity	Brief Explanation
w2052726_ Supervised	w2052726_Personal_session	A personal session is a specialized one-on-one training experience where a single player works directly with an instructor. This tailored format allows for focused skill development, personalized feedback, and customized training regimens, enabling players to enhance their abilities at their own pace.
	w2052726_Group_sesssion	A group session is a specialized training environment where multiple players participate under the supervision of one or more instructors. Group sessions can vary in focus, including fitness-play sessions, group coaching, or social-fun activities. This format encourages interaction, teamwork, and socialization among players, while still providing structured guidance from instructors.

Table 8 Specialisation supervised table

W2052726_Supervised_Group_session

General Entity	Specialized Entity	Brief Explanation
w2052726_Court	w2052726_Fitness_Play_Session	A fitness-play session is a specialized group experience that combines physical fitness with gameplay. In these sessions, players engage in exercises and drills aimed at improving their fitness levels while enjoying the dynamics of racket sports. This format

		promotes both health and skill development in a fun and engaging environment.
	w2052726_Group_Coaching Session	A group-coaching session is a specialized instructional setting where players of varying skill levels receive targeted coaching from instructors. These sessions focus on specific techniques, strategies, and skill improvement, fostering a supportive learning atmosphere. Players benefit from peer interaction and feedback while enhancing their abilities in a structured format.
	w2052726_Social_Fun	A social-fun session is a specialized group activity that emphasizes enjoyment and camaraderie among players. While instructors oversee the session, the primary focus is on social interaction and casual play rather than strict competition or intense training. This format encourages players to connect with others, make new friends, and enjoy racket sports in a relaxed setting.

Table 9 Specialisation supervised_group_session table

QUESTION 4: RELATIONSHIPS AND MULTIPLICITIES

Entity name	Multiplicity	Relationship	Multiplicity	Entity name	Brief justification for the multiplicity
w2052726_ Player	0..*	Participate	1..2	w205272_ Sport	Each player must participate in at least one sport (participation 1)
					Player can participate in a maximum of two sports (cardinality 2)
					each sport can exist without any players (participation 0)
					A sport can also have many players (cardinality *)
w2052726_ Player	1..1	Recommend	0..*	w2052726_ Player	A player can recommend zero players to the scheme (participation 0)
					A player can recommend many players to the scheme (cardinality *)
					Player can be recommended by exactly one minimum player. (participation 1)
					Player can be recommended by exactly one maximum player. (participation 1)
w2052726_ Player	1..*	Place	0..*	w2052726_ Booking	Each player can make a minimum of zero bookings. (participation 0)
					Each player can make a maximum of many bookings. (cardinality *)
					A booking must have a minimum of one player. (participation 1)
					A booking can have a maximum of multiple players. (participation *)

w2052726_ Park	1..1	Contain	0..*	w2052726_ Court	A park can have a minimum of 0 courts (participation 0) A park can have maximum of many courts (cardinality *) One court belongs to only one park minimum (participation 1) One court belongs to only one park maximum (cardinality 1)
w2052726_ Caretaker	1..*	Look after	0..*	w2052726_ Park	caretaker can be assigned to a minimum of 0 parks (participation 0) A caretaker can be assigned to a maximum of many parks. (cardinality *) Each park must have a minimum of 1 caretaker (participation 1) Each park can have a maximum of many caretakers. (cardinality *)
w2052726_ Caretaker	1..*	Maintain	0..*	w2052726_ Court	caretaker can be assigned to a minimum of 0 court (participation 0) A caretaker can be assigned to a maximum of many court. (cardinality *) Each court must have a minimum of 1 caretaker (participation 1) Each court can have a maximum of many caretakers. (cardinality *)
w2052726_ Caretaker	1..*	Maintain	0..*	w2052726_ Equipment	caretaker can be assigned to a minimum of 0 Equipment (participation 0) A caretaker can be assigned to a maximum of many Equipment. (cardinality *) Each Equipment must have a minimum of 1

					caretaker (participation 1)
					Each Equipment can have a maximum of many caretakers. (cardinality *)
w2052726_ Instructor	1..2	Guide	0..1	w2052726_ Supervised Session	Each instructor can guide a minimum of zero sessions (participation 0)
					Each instructor can guide a maximum of one session. (cardinality 1)
					Each session must have a minimum of one instructor (participation 1)
					Each session can have a maximum of two instructors. (cardinality 2)
w2052726_ Session	1..1	has	0..*	w2052726_ Booking	Each session can have a minimum of zero bookings. (participation 0)
					Each session can have a maximum of many bookings. (cardinality *)
					Each booking is associated with a minimum of one session. (participation 1)
					Each booking is associated with a maximum of one session. (cardinality 1)
w2052726_ Session	0..*	Pre-schedule	1..1	w2052726_ Court	Each session is pre-scheduled to a minimum of one court (participation 1)
					Each session is pre-scheduled to a maximum of one court. (cardinality 1)
					A court may contain a minimum of zero sessions.(participation 0)
					A court can contain a maximum of many sessions. (cardinality *)

w2052726_ Equipment	1..*	Allocated	1..1	w2052726_ Court	Each piece of equipment is allocated to a minimum of one court. (participation 1)
					Each piece of equipment is allocated to a maximum of one court. (cardinality 1)
					A court may have a minimum of zero pieces of equipment.(participation 1)
					A court can have a maximum of many pieces of equipment. (cardinality *)
w2052726_ Equipment	1..*	Allocated	1..1	w2052726_ Court	Each piece of equipment is allocated to a minimum of one court. (participation 1)
					Each piece of equipment is allocated to a maximum of one court. (cardinality 1)
					A court may have a minimum of zero pieces of equipment.(participation 1)
					A court can have a maximum of many pieces of equipment. (cardinality *)

Table 10 Relationships and multiplicities table

QUESTION 5: ATTRIBUTES AND PRIMARY KEYS

Entity name	Attributes for each entity (include PK)	Brief explanation
w2052726_Staff	w2052726_staffId {PK}	Unique identifier for each staff member.
	w2052726_email	Email address of the staff member.
w2052726_Care_Taker	w2052726_careTakerName	Name of the caretaker responsible for facility maintenance.
	w2052726_careTakerSalary	Monthly salary of the caretaker.
w2052726_Instructors	w2052726_instructorName	Name of the instructor for training sessions.
	w052726_instructorSalary	Monthly salary of the instructor.
w2052726_Park	w2052726_parkId {PK}	Unique identifier for each park.
	w2052726_parkName	Name of the park.
	w2052726_parkLocation	Location of the park within the town.
w2052726_Court	w2052726_court_id {PK}	Unique identifier for each court.
	w2052726_court_type	Type of court, such as tennis or pickleball.
w2052726_Tennis_Court	w2052726_net_height	Height of the tennis court net.
w2052726_Pickleball_Court	w2052726_court_surface	Surface type of the pickleball court.

w2052726_Sport	w2052726_sport_id {PK}	Unique identifier for each sport.
	w2052726_name	Name of the sport (e.g., tennis, pickleball).
w2052726_Tennis	w2052726_no_of_Tennis_players	Number of players in a tennis match.
w2052726_Pickleball	w2052726_no_of_pickleball_players	Number of players in a pickleball match.
w2052726_Equipment	w2052726_equipment_id {PK}	Unique identifier for each piece of equipment.
	w2052726_name	Name of the equipment used in sessions (e.g., rackets, balls).
w2052726_Fixed	w2052726_fixedLocation	Fixed location of stationary equipment within the park.
w2052726_Movable	w2052726_weight	Weight of the movable equipment.
w2052726_Player	w2052726_player_id {PK}	Unique identifier for each player.
	w2052726_name	Name of the player.
	w2052726_email	Email address of the player.
w2052726_Booking	w2052726_booking_id {PK}	Unique identifier for each booking.
	w2052726_start_time	Start time of the booking.
	w2052726_end_time	End time of the booking.
w2052726_BlockBooking	w2052726_blokbook_id	Identifier for block bookings (multiple sessions).

	w2052726_time	Time of the block booking.
w2052726_Session	w2052726_session_id {PK}	Unique identifier for each session.
	w2052726_date	Date of the session.
	w2052726_time	Time when the session starts.
	w2052726_type	Type of session (e.g., supervised, personal training).
w2052726_Supervised	w2052726_player_limit	Maximum number of players allowed in a supervised session.
w2052726_Personal_Training	w2052726_player_skill_level	Skill level required for personal training sessions.
w2052726_Supervised_Group_Session	w2052726_group_size	Number of players in a supervised group session.
w2052726_Fitness_Play_Session	w2052726_fitness_goal	The primary fitness objective for the play session.
w2052726_Group_Coaching_Session	w2052726_learning_lessons	Number of coaching lessons in the group session.
w2052726_Social_Fun	w2052726_activity_type	Type of activity in social fun sessions (e.g., recreational games).
w2052726_Unsupervised	w2052726_instructor_count	Number of instructors for the unsupervised session (if applicable).
w2052726_Single	w2052726_score_format	Format used for scoring in single-player matches.
w2052726_Double	w2052726_team_format	Format used for team

		organization in doubles matches.
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Table 11 Attributes and primary keys table

QUESTION 6: CONCEPTUAL EERD QUALITY AND NOTATION

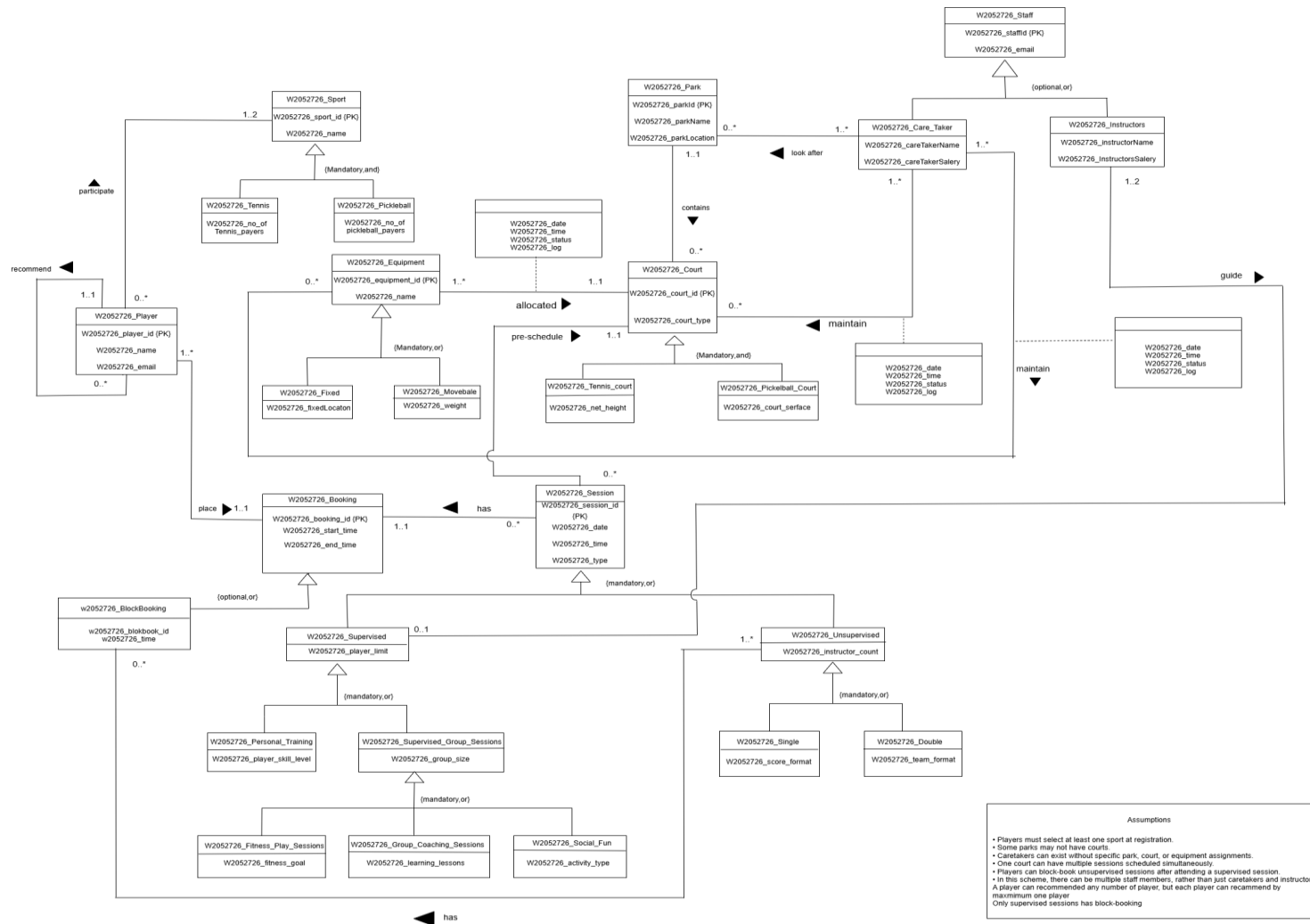


Figure 2 Conceptual EERD diagram

QUESTION 7: MAPPING CONCEPTUAL EERD TO LOGICAL ERD

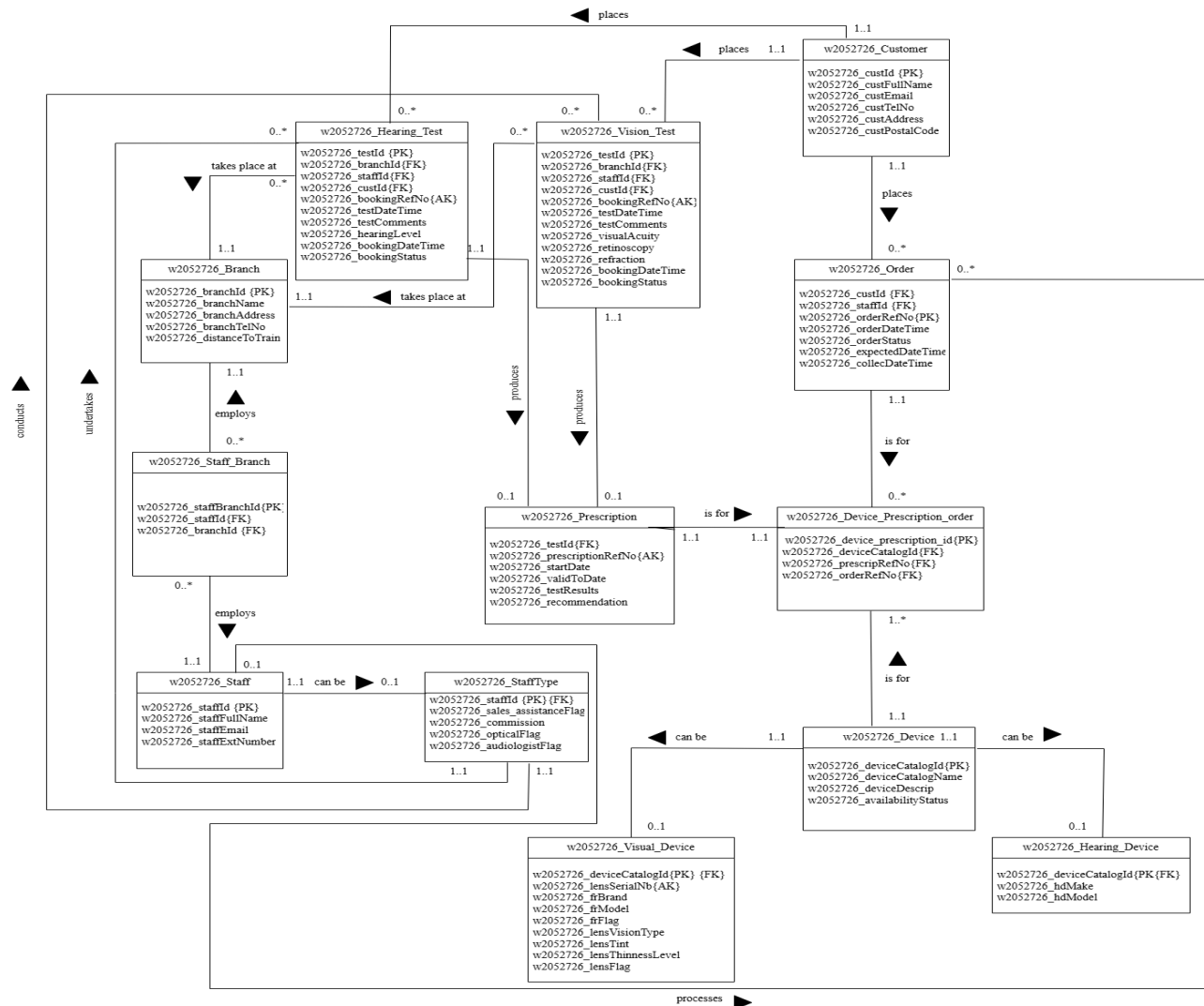


Figure 3 Logical ERD