

Note: This is an individual assignment. While it is expected that students will discuss their ideas with one another, students need to be aware of their responsibilities in ensuring that they do not deliberately or inadvertently plagiarize the work of others.

CP2404 : SP51-2023

Assignment 1 – Database (conceptual) Modelling

Assessment Weight: 30%

Rationale

This assignment has been designed to assess students' ability to model a database, by constructing an entity-relationship diagram for a particular business scenario. This assignment addresses the following learning objectives for this subject:

- Develop a database model using the entity-relationship model
- Apply the techniques of normalisation

Requirements (Tasks)

You are given a business scenario and are required to draw an ERD for the scenario.

- **Task 1 :** Draw an **Entity-Relationship Diagram (ERD)**, which is fully labelled and implementable, based on the business descriptions. Include all entities, relationships, optionalities, connectivities, cardinalities and constraints. You must use **Crow's foot notation** and **MySQL Workbench** to create the ERD. **A Hand-drawn ERD will NOT be accepted.** A sample ERD can be found in Appendix A of this document.
- **Task 2 :** In the Word document, Write a **point-form summary** to describe the major justifications, assumptions and limitations related to your database design. For example: Assumption/justifications for optionality, connectivities, constraints data type and data domain; and Special cases or data integrity issues that cannot be handled.

Submission Items (3):

Include the following in your submission (via LearnJCU):

- The original Workbench file containing your ERD (.mwb). Name the file as **LastnameFirstname-A1.mwb**
- Export the ERD diagram as a picture PNG file. Name the file as **LastnameFirstname-A1.PNG**
- A document file (DOCX or PDF format) which contains your **answers for Task-2**. Name the file as **LastnameFirstname-A1.docx** or **LastnameFirstname-A1.pdf**.

Business Description (Scenario)

In Singapore, a prominent businessman, Bill Jobs owns a number of sports training schools, where children are given coaching for various sports by expert trainers. Customers sign up their child/children for training sessions on a need basis, such as when they have competitions, when they have school holidays, etc. For several years, each school has been run independently, thereby creating several problems of inconsistency and different standards. Recently, Bill decided to transform his business to build an extended school group. In this new business system, existing schools will be combined as one school group named "ActiveKids" and each school will be run as a branch of this giant school group. Bill has bigger plans to build more branch schools throughout Singapore and increase enrollment. He decided to develop a new central database system to store, integrate and manage all relevant data and to computerize its operations. Once this central system is in operation, each branch school will be connected to this central database and their data-related operations will be governed by this central database system.

You have been asked to design a database that satisfies many user requirements provided by this school group. General business description and various user requirements are summarized in the following sections.

ActiveKids has its headquarters in Kallang while the branches are located at several places including Kallang and other districts such as Clementi, Bugis, Bishan, etc. The central database keeps information about branches, staff, equipment, customers and their children and training-session information. Each branch has an ID number that uniquely identifies the branch, and the authorized users of the database should be able to track details of the branch such as name, location, details of employees (staff) who currently work there, etc.

Every branch of ActiveKids is supervised by a branch manager. One requirement is ActiveKids database will be used to generate reports for various HR (Human Resources) purposes. For example, an authorized user should be able to generate a report to show the current employee records of a specific branch, a report to list all the branches and their details, a report to show the employee history of a branch including all records of previous managers and other employees, or a report to compare how much total salary has been paid for each branch over the past 5 years.

Some of ActiveKids employees are professional training staff, who train the children on various sports and while others are admin staff, who take care of paperwork, attend phone calls, etc. All of these staff are permanently employed by ActiveKids and their employment is governed by the central group, but some local staff are employed at a branch level temporarily (called as "casual workers") for facilities cleaning. For all permanent staff, ActiveKids database needs to keep personnel information of all these staff and information about relevant qualification, certification start/end info, etc of all training staff so that an authorized user of the database can generate a report to show the status of professional human resources that ActiveKids employs. The information about casual workers is recorded in the database but only basic information (name, contact, address, DOB, start date, end date, payment rate, work hours etc.) are required to be kept and managed.

All ActiveKids employees (training staff and admin staff) must have an access card while some of them use an iPad, both of which are assigned to each employee when they join the company, and which they return when they leave. Casual workers are provided an access card but not an iPad. Each access card and iPad have a unique number for stock-take purposes. Access cards or iPads are fully managed by ActiveKids for any issue including repair, faulty parts, etc. Employees can return their assigned equipment when faulty, to replace with other good-condition equipment. The authorized user of the database should generate a report showing, for each access card, the access card's number, the building sections it allows access to, and the name of the employee it has been supplied to and assign start/end dates. In a similar way, the user should be able to generate a report that shows for each iPad : the iPad number, model, colour, other specifications, history of repairs (if exists) and the name of the employee(s) it has been assigned to.

ActiveKids also wants to keep their all customer-relevant data centrally so that the head office can manage status of all customers (and their children) of each branch and can generate a report to compare each branch's customer status (in terms of current numbers, growing rate, etc.). ActiveKids runs an incentive system to reward annually the branch which achieved the most significant growth rate throughout the year. Customer information includes contact details to enable newsletters and other information to be mailed to the customer.

The school has different billing rates depending on the customer. Staff members receive a 15% discount on all sports training sessions and sports gear purchase, while valued customers may qualify for a 10% discount. The discount rates are reviewed each year and are open to change (eg. Staff discount rate was 10% but at the last wage bargaining discussions it was agreed to increase the rate to 15% in lieu of a salary rise).

Customers can bring their children to these schools for specific sports training sessions depending on their timings and needs. Various particulars of the children such as name, date of birth, gender, height, weight, digital photo etc are gathered and stored in the database. The training staff would also like to be able to store a general comment about the child with their record as well. If a child has not been in for a training-session in the last 3 years, then the child's records are removed from the database. The school believes in healthy lifestyle for the children. If the child did not attend coaching at the school for 6 months, then a reminder notice is mailed to the parent.

Every child's training-session information should be recorded to keep details about the specific training done, the trainer details, number of hours, etc. All customers receive an itemized account of each training-session. Customers may also buy certain sports gear such as bats, balls, gloves, t-shirts, bags, etc if the children need them. If the training-session involves more than one child, each child's training and gear purchased appear grouped together with a subtotal. All training-sessions incur a 8% Goods and Services Tax which is shown on the invoice.

The database needs to provide user-interfaces for facilitating the entry of the information by the school admin staff. The new system design needs to be able to produce several reports which can be used by authorized users. Some of these include a name listing of all the current customers and their children, training-session invoicing reports and mailing labels. Samples of what the client expects these reports to look like are shown in the next page of this document. Please note that these are just some report samples and more various reports should be able to be created by the school admin staff or head office once the database is fully implemented.

Samples of few of the required reports are below :

- 1) Report that provides a list of all children who attended sessions in Feb-2023, with details of their parent's names, contact, date of session and session fees (\$\$) made.

SessionDate	Child name	Parent's name	Parent Contact	Session Fees (\$)
2-Feb-2023	Jenny So	Lucy So	97475637	\$ 456.00
3-Feb-2023	Vijay R	Rajendran	97354758	\$ 873.50
10-Feb-2023	Susan Tan	Tan Hui Sion	94264725	\$ 357.75
17-Feb-2023	Chow Meng	Meng Ho Tat	96582665	\$ 735.00

- 2) Report that lists Total Salary paid to employees for each branch by year:

District	BranchID	Total Salary Paid	Year
Clementi	BR001	\$ 56,345.00	2022
Bugis	BR002	\$ 83,234.00	2022
Bishan	BR003	\$ 5,765.00	2022
Kallang	BR004	\$ 73,643.00	2022

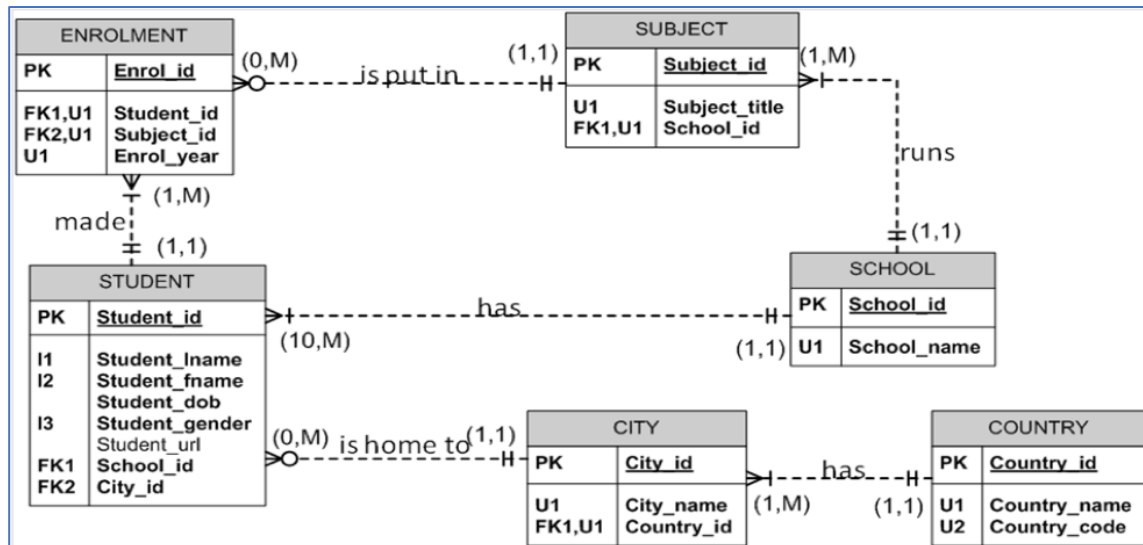
- 3) Report that lists all the iPads with their details and the name of employee to whom they have each been assigned to :

EquipmentID	Equipment Type	Purchase Date	Date Assigned	Date Returned	Employee ID	Employee Name
EQP1002	iPad Mini	20/12/21	12/02/22	03/02/23	23	Shelly Fox
EQP1004	iPad Pro	11/10/22	07/01/23	-	41	Dorothy R
EQP1011	iPad Air	15/07/22	29/12/22	-	67	Mani Selvan
EQP1018	iPad Air	25/02/22	13/01/23	14/01/23	73	Henley Ho

- 4) Invoice to Customer :

Customer Info :	Percy Jack	Invoice No:	XDAG1105
	13, Clementi Ave,	Invoice Date:	23/02/2023
	Singapore 765436	Child's Name	Melly Song
	Session	Details	Price
	Training	Badminton (2 hours)	\$ 500.00
	Sports Gear	Badminton Net (1)	\$ 25.00
		Total	\$ 525.00
		Discount (15%)	\$ 78.75
		SubTotal	\$ 446.25
		GST (8%)	\$ 35.70
		Amount Due :	\$ 481.95

APPENDIX A



Note about the example ERD provided above:

- You are not required to specify extra information like FK1, FK2, U1, I1, I2 etc. Just ignore the notation from the example ERD given above. You are required to specify PK and FK clearly. MySQL Workbench will present PK or FK using the colour icons. If you use other ERD drawing tools you may notate PK and FK using underline ____ or square bracket [] respectively.
- You are not required to specify obvious cardinalities like (0,M), (1,1), (1,M) etc. You are required to specify specific cardinalities which are not presented using crow's foot notation like (1,3), (4,10), (10,M) etc.
- If you want to present the supertype-subtype relationships using an extended-ERD (EERD), you will need to draw the necessary EERD notations using facilities provided by the drawing tool software you use. Alternatively, you can present the supertype-subtype relationships using multiple 1:1 relationships having same PKs for all related entities and describe the special relationships in your document.