Class Activity 1:

Introduction to Databases and Data Modelling I

Lecture 1 Activities

1. Read the case study below and write a list the business rules. (5 BRs in 5 minutes)

Online Camera Shop **Case Study**

> The Online Camera Shop database keeps records of customers and their wish lists for managing market campaign. **Every customer needs to register on the site by providing his/her personal information including name, home address, email address and contact phone number**. The system will generate a **unique customer number** for each customer when his/her registration is successfully completed.
>
> Customers can **create their own private wish lists, which contain their favourite cameras** they wish to purchase. The system will automatically generate a **unique number for a wish list of a customer** in order to trace all the wish lists. The system also stores the **date that the wish list** of the customer has been created. Within a wish list, customer can add as many cameras as he or she likes. For each entry in a wish list, which is for one and only one camera, customer can make a brief note, for example, “this is my first choice”. A camera is described by a unique camera number, a camera name and a standard price.
>
> A **customer may be allocated to an employee** of the shop. An employee is described by a unique employee no, a name and a contact phone number. In order to attract more sales, the **top manager will regularly propose promotion deals for customers to buy specific cameras**. Each promotion deal is described by a start date, an expiry date and a discount rate for a specific camera model. Some employees also act as supervisors for other employees.

The **Business Rules** are:

- Customers can create accounts with personal information and will be provided an UID on account creation
- Customer can create multiple wishlists for their wanted cameras. Each wishlist also contains the creation date.
- Each wishlist can contain multiple cameras including the ability to store a small note for the wishListed camera.
- An employee may be assigned to a customer. (optional, 1:1 relationship)
- Managers can set promotion deals for specific cameras. Promotion details include start/end date, discounted price/percentage, camera UID.

2. Which definition is **NOT** correct?
    - Attribute is property or characteristic of an entity or relationship type
    - Business rules are derived from policies, procedures, events, functions

    - `System outputs can be appropriate entities` ***Not Correct*** Its bad practice to store query results/ reports in the main db.
    - None of them

3. Use the following BR to determine `related entities`, `attributes`, `attribute types` (optional/NOT NULL, etc.), `identifiers`, `relationships` (optional/mandatory), etc. (5 minutes)

    - **BR1**: Every customer needs to register on the site by providing his/her personal information including name, home address, email address and contact phone number.
    - **BR2**: The system will generate a unique customer number for each customer when his/her registration is successfully completed.

- **Entity**: Customer
- **Attribtes**: `type`
    - CustomerID: `NOT NULL PRIMARY KEY` autogenerated uid
    - FirstName: `NOT NULL` simple
    - LastName: `NOT NULL` simple
    - HomeAddress: `NOT NULL` composite
    - Email: optional simple
    - ContactNum: optional simple
- **Identifiers**: The PK(CustomerID) of the Entity is the Identifier.
- **Relationship**: CustomerID can be used as a ForeignKey in other entities as a relation link.

4. Provide an entity that has `composite identifier`. Draw the correspond table to the entity with some sample data that shows the composite identifier uniquely identifies each row (individual instance) of the table. The table should have at least 3 rows of data. (5 minutes).

Composite Identifier: A combination of 2 or more attributes that can be used to distinguish an instance of the entity type.

Example composite identifier

A simple e-comerce system containing 3 entities: User, Orders, Items

User Entity

NOTE: the stored pw is a hash string generated from encrypting the actual password.

UserID	UserName	Password	Email
1001	HelloThere2	z7s94jwu17aha	ken@bony.com
1002	ohyeah22	zua90wtIasng2i	redshirt@mail.com
1003	iuseArchbtw	4zmeh803hiewj	something@domain.com

Order Entity

In this case, 3 attributes `UserId`, `ItemId`, and `PurchaseDate` is used as a composite identifier. Just using `UserId` and `ItemId` is not specific enough as a user can purchase the same item at different

times.

UserID	ItemId	PurchasedDate	Quantity
1001	3509	02/12/2018	2
1002	3509	20/12/2018	5
1001	3508	02/01/2019	1

Items Entity

ItemId	ItemName	Description	Price
3508	Kindle PaperWhite	E-book reader	150
3509	Amazon Echo Dot	Mini Smart Speaker	30
3510	Amazon Echo	Smart Speaker	100

Review Questions (NOT MARKED)

Note: You don't need to provide the answer of the review questions in your submission

1. Define each of the following key terms: (NOT MARKED)

- **Data** recorded representation of objects, events, facts to be stored. Data is usually meaningless without context.
- **Information**: Processed data that can be use by the user to gain knowledge.
- **Metadata**: Provide Logical information about the structure of entities
- **Database application**: Software/Webapps that lets the end user carry out CRUD functions for the db
- **Constraint**: limitation, e.g the datatype Char(5) means the data for that attribute is limited to 5 characters
- **Database**: Collection of logically stored data
- **Entity**: Represents as a table in the db
- **Database management system**: Software that interface with the DB (Microsoft SQLServer)
- **Conceptual data model (or schema)**: Combination of different external views to form a highlevel, abstract view of the whole db architechture.
- **Logical data model (or schema)**: the Metadata
- **Physical data model (or schema)**: Model of how Data is represented and stored physicaly.

1. **Contrast** the following terms: (NOT MARKED)

- **Structured data v unstructured data**
  - Structured data are often **Simple & Sortable** (name, price, age, date)
  - Unstructured data are often **larger & complex** files(image, audio, video)
- **Data v information**
  - **Data:** recorded objects, often meaningless without context

- **Information:** Created by combining related datasets, giving it context. Used by the end users to gain knowledge.

Tutorial 1 Activities

1. The following information relates to driver license. **Differentiate** between `data` and `metadata`. Identify the `type of data`.
    - `Simple Data` Driver's name, address, and birthdate.
    - `Metadata` The fact that the driver's name is a 30-character field.
    - `Complex Data` A photo image of the driver:.
    - `Complex Data` An image of the driver's fingerprint.
    - `Simple Data` The **make** and **serial number** of the scanning device that was used to scan the fingerprint.
    - `Simple Data` The resolution (in megapixels) of the camera that was used to photograph the driver.
    - `Metadata` The fact that the driver's birth date must precede today's date by at least 16 years.
2. **Describe a database** that you are familiar with.

- Briefly explain what **type of system** the database supports (e.g. order management, library loans, personal banking).
    - E-comerce services like Amazon & BookDepository
- How do you think using a database affects the quality of the service or product provided by that organization or business? Why?
    - For BookDepository, Db allows the site to be more user friendly. the DB let the user to see if a particular book is out of stock or not. If it is out of stock, they would also reccomend checkcing out another Books E-comerce site.
    - The Db also make it more flexible for users to store different wishlists, multiple delivery address & payment methods.
- List the **entities** and **relationships** that you think the database contains.try to identify the relationships that link the entities.
    - **Entities**: User, Address, PaymentDetails, Wishlist, Books, Purchases
    - **Relationships**
        - User 1:m Address
        - User 1:m PaymentDetails
        - User 1:m WishList
        - WishList 1:m Books
        - User 1:m Purchases
        - Purchases m:m Books

3. Explain the difference between a **procedural** and a **nonprocedural** language. Name one procedural language and one nonprocedural language. What statements belong in a procedural language, but not in a nonprocedural language?
    - **Procedural** Propper OOP programming languages. c, c++, c#, java, js, py, swift, GoLang

        - `public static void main(String[] args){}`: basic main method for c# and java.
    - **Non-Procedural** NPL or NonProcedualLanguage simpler stuff SQL
        - `SELECT * FROM table_name WHERE attribute_a = value` : Show all entity instances displaying all attributes from table/entity named `table_name` where `attribute_a` equals/contains the value `value`.

4. Answer the following questions:

    - What is the purpose of the **ANSI/SPARC** architecture
        - To visualize/describe the structure of the db in the design stage of the SDLC. (System Development Life Cycle)
    - Explain the concept of **data independence**
        - Similar to the Decoupling Design Pattern in Software, Data Independence is a db design which allows for the ease of change to different aspects of the DB with out affecting the data.
    - Differentiate between **logical** and **physical** data independence.
        - **Logical**: The ability to modify the metadata without affecting the softwares that is using the db.
        - **Physical**: The Ability to change the physical storage without affecting the logic of the data. Upgrading/Downgrading the physical drives with out affecting the entities metadata in the db.