**2. Entities and Attributes**

SUPPLIER

* Bank\_Account\_Number: simple, single-valued, integer, Key Attribute
* Company\_Name: simple, single-valued, string
* Contact\_Info: simple, single-valued, string

BOOK

* Title: simple, single-valued, string
* ISBN: simple, single-valued, integer, Key Attribute
* Author: composite (FName, Middle\_INIT, LName), single-valued, string
* Price: simple, single-valued, real
* Amount\_In\_Stock: simple, single-valued, integer

ORDER

* Date: simple, single-valued, date
* Time: simple, single-valued, time
* Transaction\_Number: simple, single-valued, integer, Key Attribute

EMPLOYEE

* Name: composite (FName, Middle\_INIT, LName), single-valued, string
* IRD\_Number: simple, single-valued, integer, Key Attribute
* Contact\_Number: simple, single-valued, integer
* Weekly\_Hours: simple, single-valued, real
* Hourly\_Rate: simple, single-valued, real
* Wage: derived, single-valued, real

CUSTOMER

* Delivery\_Address: composite(Street\_Number, Street\_Name, Suburb, City, Postcode), single-valued, string
* Customer\_ID: simple, single-valued, integer, Key Attribute
* Name: composite (FName, LName), single-valued, string
* Phone\_Number: simple, single-valued, integer

QUALIFICATIONS (Weak entity)

* Name: simple, single-valued, string, Weak Key Attribute
* Type: simple, multi-valued, string
* Date\_Received: simple, single-valued, date
* Expiry\_Date: simple, single-valued, date

**3. Relationships**

SUPPLIES

* M: N relationship.
* There are many suppliers on the database of the bookshop, each supplier could supply multiple (types of) books.
* SUPPLIER is total participation; BOOK is total participation.

WORKS\_FOR

* N:1 relationship
* An employee can only work for one bookshop, a bookshop can have many employees working for it.
* EMPLOYEE is total participation; BOOKSHOP is total participation.

SELLS

* M:N relationship.
* Multiple number of employees can sell a multiple number of orders to customers.
* EMPLOYEE has partial participation; ORDER has total participation.

HAS

* 1:N relationship.
* One employee could have multiple qualifications, but not every employee has a qualification.
* Each qualification is identified through identifying the employee first.
* EMPLOYEE has partial participation; QUALIFICATION has total participation.

MAKES

* 1:N relationship.
* One customer can make multiple orders over time.
* Both ORDER and CUSTOMER has total participation.

CONTAINS

* 1:N relationship
* One order can contain multiple number of books.
* BOOK has partial participation; order has total participation in this relationship.

Teamwork summary:

Through this assignment 1, we learnt two lessons:

1. The abstraction of entity type is much harder than we thought. An action which people took for granted in daily business flow can relate to multiple entity type and different people due to their perspective can have different opinions on it. During the process of modeling our chain bookshop, we changed back and forth on the choice of entity type and relationship among them. For some entity type, the choice is straightforward. But some entity type become the focus of our discussion. For example, there was an entity type called “Account” which means to record the financial information of a bookshop. But because of incorrect concept of this “Account” which should not be an entity type by itself, any entities has connection with it have unnatural relationship. This once causes our group had division and different opinions. Through group discussion, we all agree that it should be downgraded to an attribute on the entity type bookshop. By doing that, other entities and relationships related to it have more flexible choices and the business flow become much more clearly and natural. This teaches us the abstraction of entity type is crucial and is very similar with the abstraction of class from object-oriented programming.
2. Another lesson is about teamwork specially during the initial concept forming. We should do detailed analysis until we all agree on the basic business flow. Otherwise, the version of the work changed a lot. It is not efficient. Except that, we agree to use github to coordinate our work. We think this will improve our work efficiency in further assignment.

At last, all tasks were properly allocated and has been discussed among all group members, and the result of this assignment is based on all the member’s agreement.