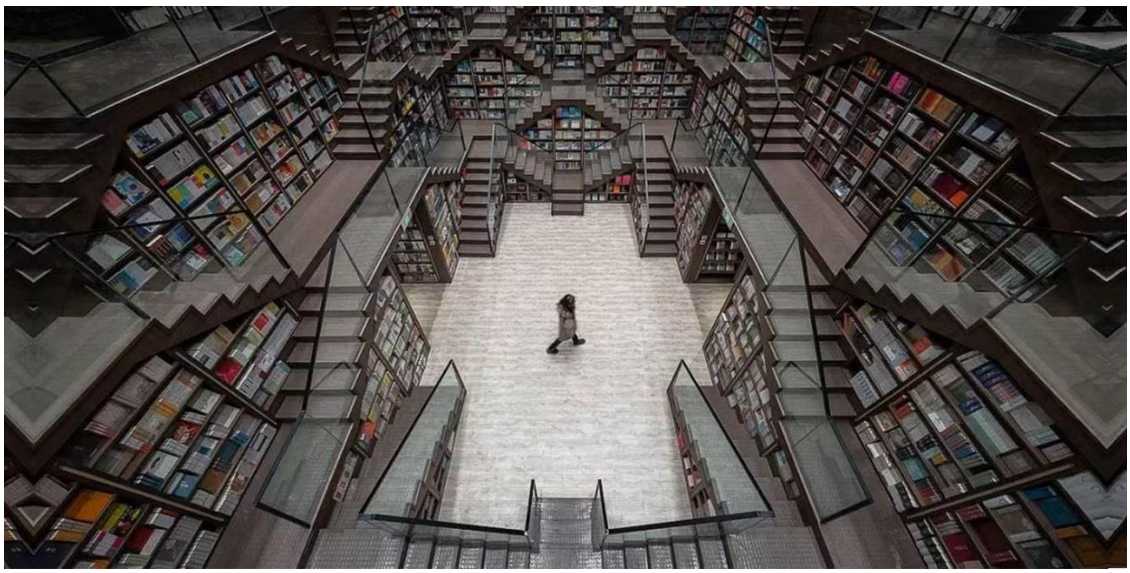
Ningbo Bookstore
Database System



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Introduction

With the rapid development of information technology, a proper application of database can translate amounts of data into important information. This database system is designed to fulfill the information needs of a bookseller in Ningbo, who owns one online book store and three offline bookstores. In general, this database helps the bookseller to understand customer, manage

staff, and adjust business strategy. It allows customers to apply cross-channel shopping, receive discounts, enjoy after-sale service and give comments. Bookstore managers are able to maintain customer relationship through membership system and book recommendation. Furthermore, it enables managers to analyze customer's needs and improve their purchasing intention. It also provides a channel for managers to collect customer feedbacks and improve their service. In addition, managers can manage human capital more efficiently by using this database. More importantly, the design of this database system is flexible to cope with the business expanding.

This report consists of five sections. Firstly, database documents are listed, including entity list, business rule, rough entity relationship diagram, ERD, data schema and data dictionary. In the second section, database implementation is realized through editing Structured Query Language (SQL). Next, linear-regression analysis and data visualization are suggested as business intelligence methods. Finally, the evaluation and improvement of the database are provided.

SECTION 1: Data Model

1. Entity list

There are in total 13 entities in this database.

1) Customer

2) Staff

3) Online Bookstore

4) Offline Bookstore

5) Shopping Cart

6) Order

7) Transaction

8) Comment

9) Book

10) Membership

11) Preference

12) Logistics

13) After-sale Service

2. Business Rule

1) Customer and Membership

a) Each customer can have one membership.

b) Each membership belongs to one customer.

2) Customer and Preference

a) Each customer has one or more preference.

b) Each preference belongs to one customer.

3) Customer and Online Bookstore

a) Each customer can visit one online bookstore.

b) The online bookstore can be visited by one or more than one customer.

4) Customer and Offline Bookstore

a) Each customer can visit one or more than one offline bookstore.

b) Each offline bookstore can be visited by one or more than one customer.

5) Online Bookstore and Shopping Cart

a) Online bookstore can add books to one or more than one shopping cart.

b) Each shopping cart can contain one or more than one book from online bookstore.

6) Shopping Cart and Order

a) Each shopping cart can generate one or more than one order.

b) Each order comes from one shopping cart.

7) Order and Transaction

a) Each order creates one transaction.

b) Each transaction comes from one order.

8) Order and Comment

a) Each order can have one or more than one comment.

b) Each comment can be made based on one order.

9) Order and Book

a) Each order request one or more book.

b) Each book is requested by one order.

10) Order and After-sale Service

a) Each order can apply for one or more than one times of after-sale service.

b) Each after-sale service can be applied to one order.

11) Order and Logistics

a) Each order is delivered by one logistics.

b) Each logistics can deliver one order.

12) Consumer and Staff

a) Each consumer can consult one or more than one staff.

b) Each staff can serve one or more than one staff.

13) Consumer and Logistics

a) Each consumer can receive one or more than one package through logistics.

b) Each package in logistics is delivered to one customer.

14) Staff and Online Bookstore

a) Each staff work for one online bookstore.

b) Each online bookstore is managed by one or more than one staff.

15) Staff and Offline Bookstore

a) Each staff work for one or more than one offline bookstore.

b) Each offline is managed by one or more than one staff.

4. Data Scheme

1）Customer {CustomerID#, cFirstName, cLastName, cAge, cGender, cAddress1, cAddress2, cAddress3, cAddress4, cPhoneNumber, cBirthDate, cEmailAddress, cPassword, cUserName, cSecurityQuestion, cSecurityAnswer, CustomerLogTime, MembershipID, OfflineBookStoreID, Webname}

2）Membership {MembershipID#, mLevel, mDiscount, mTotalExpenditure, CustomerID}

3）Order {OrderID#, OrderDate, OrderType, Delivery, ReceiverPhoneNumber, ReceiverAddress, ReceiverName, TotalPrice, Remark, StaffID, BookID, TrasactionID, CustomerID, MembershipID}

4）Transcation {TranscationID#, PaymentMethod, Poststatus, Recevstatus, TotalPrice, CustomerID, mDiscount, OrderID}

5）Staff {StaffID#, sFirstName, sLastName, sPhoneNumber, sGender, sDepartment, sCapacity, sAddress1, sAddress2, sAddress3, sAddress4, sAccount, sPassword, OfflineBookStoreID}

6) Book {BookID#, bCategoryID bName, bPublishTime, bPress, bAuth_FirstName, bAuth_LastName, bCategoryName, bViews, bPrice, bStoreamount, bMonthlySales, bIntroduction, bvolume, btranslator, bMprice, bstoretime, bComment}

7) After-sale Service {AfterSaleServiceID#, Refund, Barter, OrderID}

8) Comment {CommentID#, StaffFeedback, Cdate, StaffFeedback, BookFeedback, BookRating, StaffRating, OverallRating, OrderID, StaffID, BookID}

9) OfflineBookStore {OfflineBookStoreID#, StoreAddress1, StoreAddress2, StoreAddress3, StoreAddress4, StorePhoneNumber, StaffNumber, StoreManager, Postcode, StaffID}

10) OnlineBookStore {Webname#, Weblogo, Website, Shop Stream, Worktime, Commque, Dealrule, Law, Phone Number, StoreManager, StaffID}

11) ShoppingCart {ShoppingCartID# BookAmount, Total Price, CustomerID, BookID, MembershipID}

12) Logistic {DeliveryID#, lName, lAddress1, lAddress2, lAddress3, lAddress4, lPhoneNumber, StaffID, OrderID}

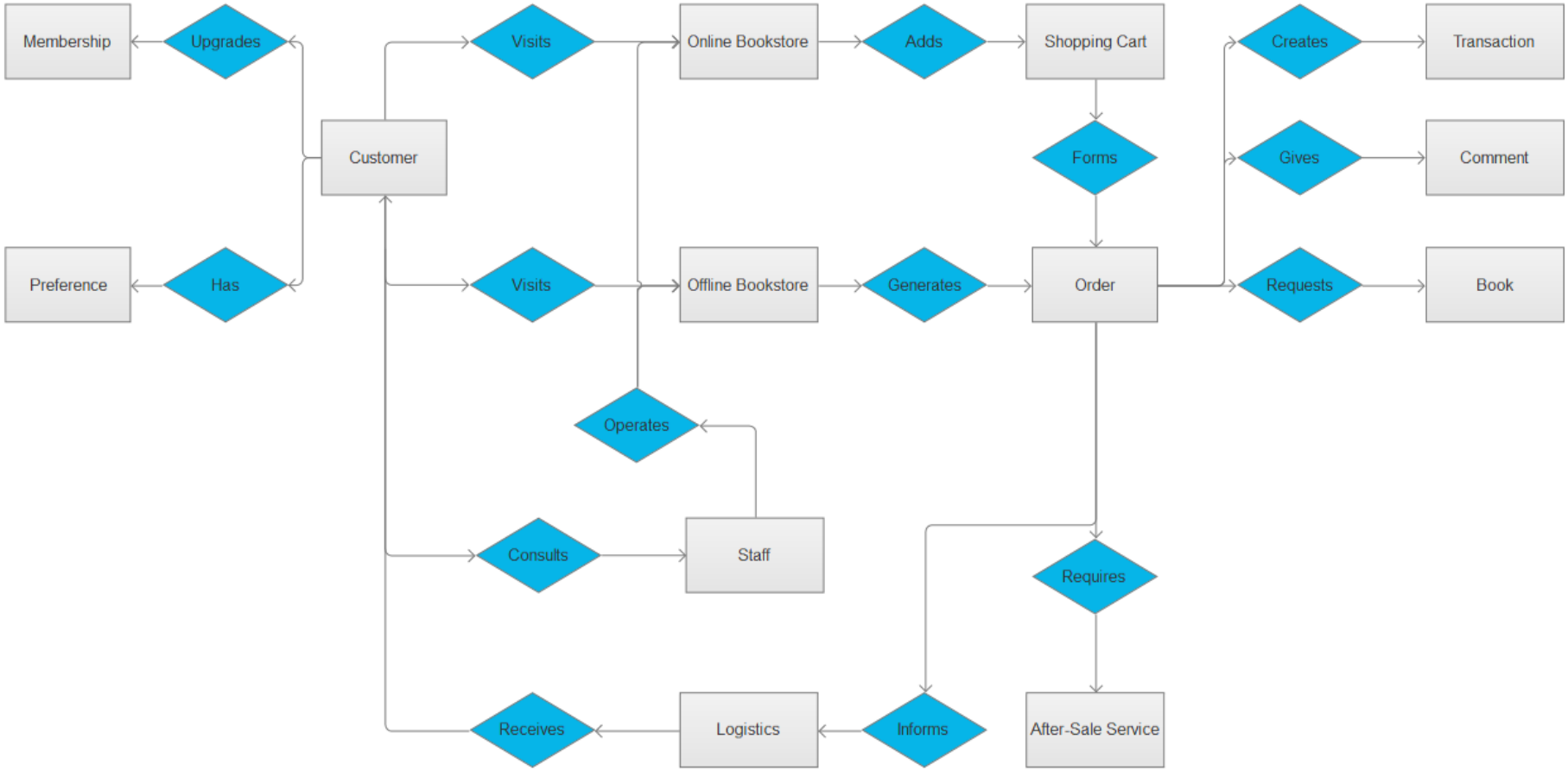
13) Preference {Preference ID#, PurBooksCate, PurBookTopc, PurBooksAuth, PurBooksLan, PurBooksTran, PurNumCate, CustomerID}

5. Entity Relationship Diagram

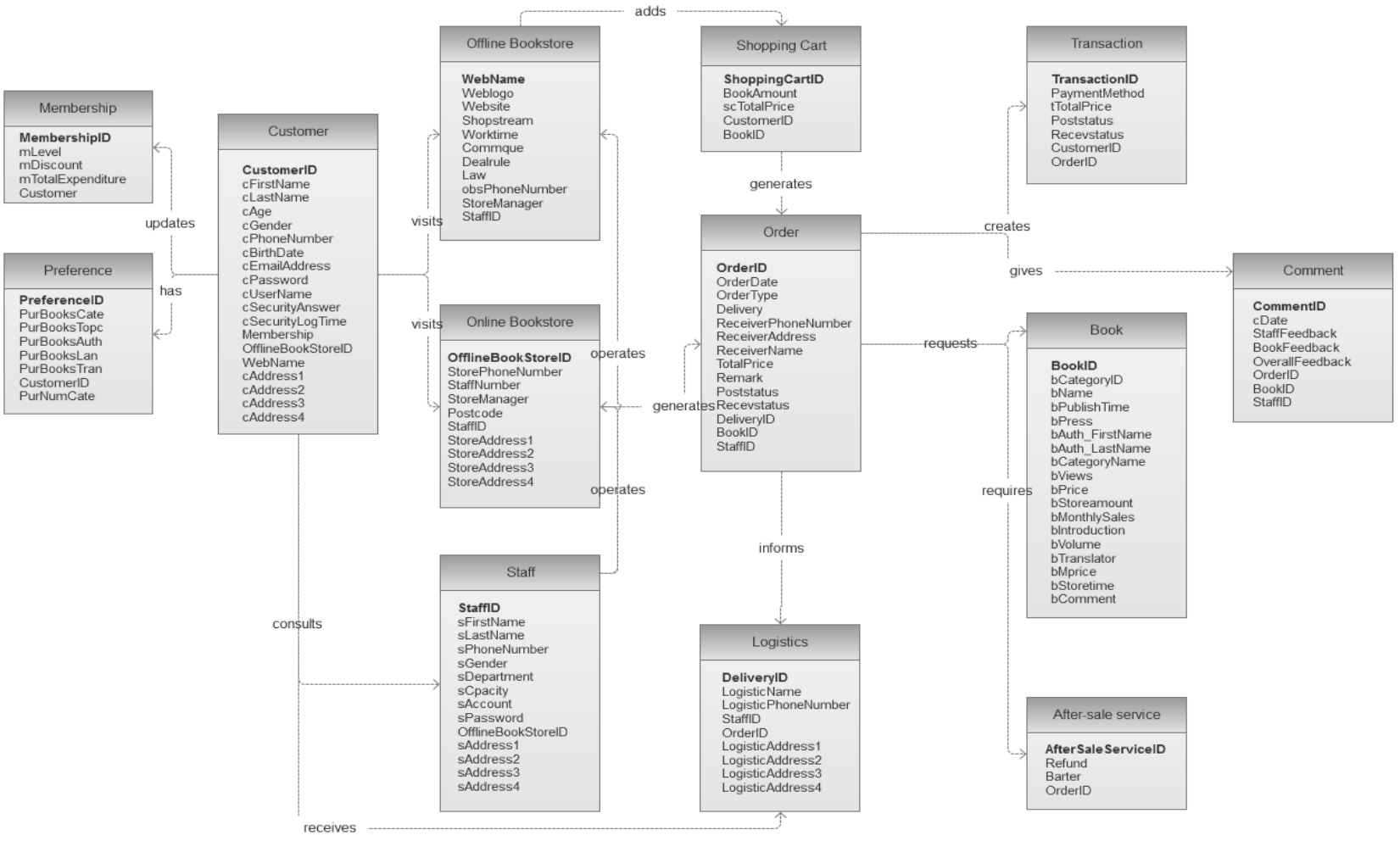
a. Rough Entity Relationship Diagram

	Customer	Membership	Order	Transaction	Staff	Book	After-sale Service	Comment	OfflineBookStore	OnlineBookStore	ShoppingCart	Logstic	Preference
Customer				Pay	enquiry		Apply	Write	Visit	Visit	Operate	Require	Has
Membership	Owned by												
Order													
Transcation			Generated by										
Staff						Manage	Deal with						
Book													
After-sale Service													
Comment													
OfflineBookStore			Generate										
OnlineBookStore			Generate										
ShoppingCart			Generate										
Logistic			After		Monitored by	Deliver							
Preference					Analyzed by								

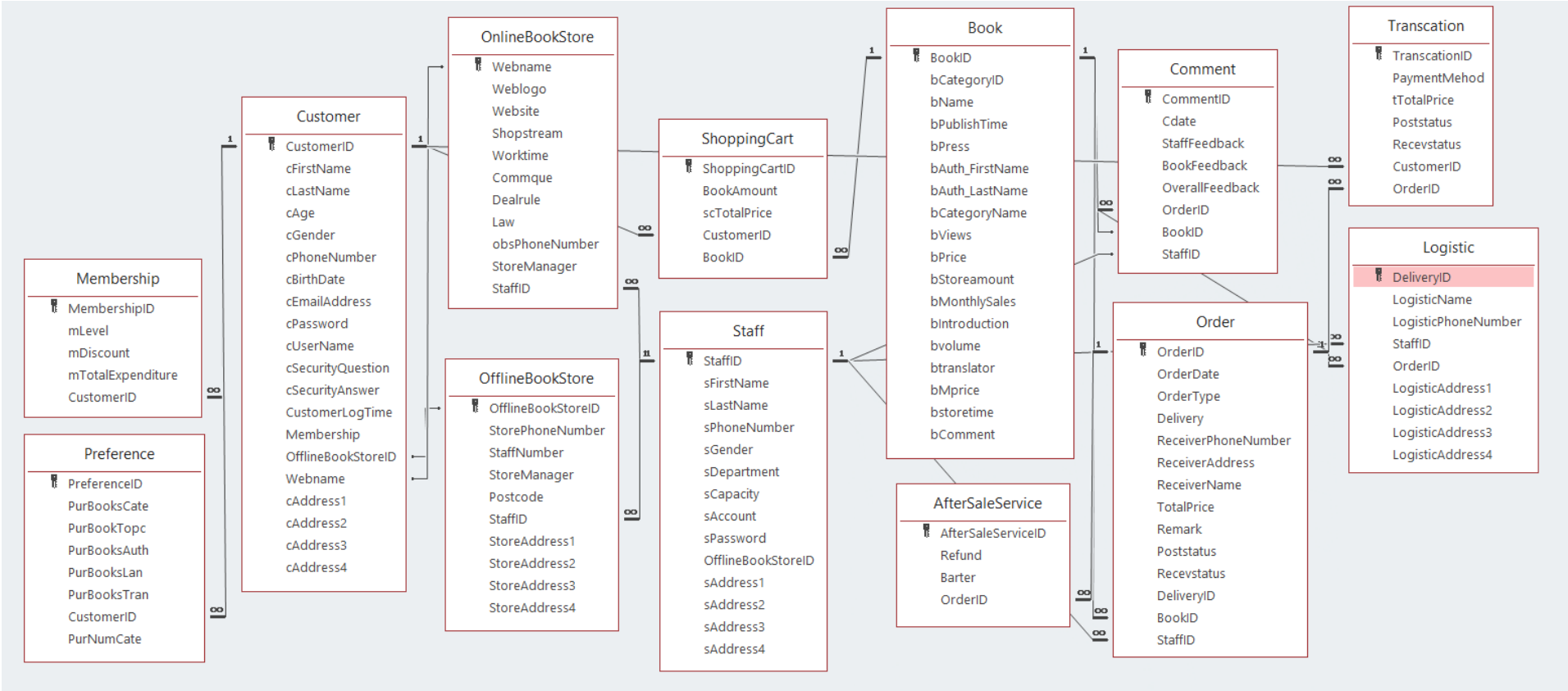
b. Fully Entity Relationship Diagram



c. Fully Attributed ERD



d. TRD


Membership
MembershipID
mLevel
mDiscount
mTotalExpenditure
CustomerID
Preference
PreferenceID
PurBooksCate
PurBookTopc
PurBooksAuth
PurBooksLan
PurBooksTran
CustomerID
PurNumCate
Customer
CustomerID
cFirstName
cLastName
cAge
cGender
cPhoneNumber
cBirthDate
cEmailAddress
cPassword
cUserName
cSecurityQuestion
cSecurityAnswer
CustomerLogTime
Membership
OfflineBookStoreID
Webname
cAddress1
cAddress2
cAddress3
cAddress4
OnlineBookStore
Webname
Weblogo
Website
Shopstream
Worktime
Commque
Dealrule
Law
obsPhoneNumber
StoreManager
StaffID
OfflineBookStore
OfflineBookStoreID
StorePhoneNumber
StaffNumber
StoreManager
Postcode
StaffID
StoreAddress1
StoreAddress2
StoreAddress3
StoreAddress4
ShoppingCart
ShoppingCartID
BookAmount
scTotalPrice
CustomerID
BookID
Staff
StaffID
sFirstName
sLastName
sPhoneNumber
sGender
sDepartment
sCapacity
sAccount
sPassword
OfflineBookStoreID
sAddress1
sAddress2
sAddress3
sAddress4
Book
BookID
bCategoryID
bName
bPublishTime
bPress
bAuth_FirstName
bAuth_LastName
bCategoryName
bViews
bPrice
bStoreamount
bMonthlySales
bIntroduction
bvolume
btranslator
bMprice
bstoretime
bComment
AfterSaleService
AfterSaleServiceID
Refund
Barter
OrderID
Comment
CommentID
Cdate
StaffFeedback
BookFeedback
OverallFeedback
OrderID
BookID
StaffID
Order
OrderID
OrderDate
OrderType
Delivery
ReceiverPhoneNumber
ReceiverAddress
ReceiverName
TotalPrice
Remark
Poststatus
Recevstatus
DeliveryID
BookID
StaffID
Transcation
TranscationID
PaymentMehod
tTotalPrice
Poststatus
Recevstatus
CustomerID
OrderID
Logistic
DeliveryID
LogisticName
LogisticPhoneNumber
StaffID
OrderID
LogisticAddress1
LogisticAddress2
LogisticAddress3
LogisticAddress4

6. Data dictionary

Customer	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	PK		not null
	cFirstName	Customer's First Name	TEXT					not null
	cLastName	Customer's Last Name	TEXT					not null
	cAge	Customer's Age	NUMBER					not null
	cGender	Customer's Gender	TEXT		Male/ Female/			not null
	cAddress1	Customer's Province	TEXT					not null
	cAddress2	Customer's City	TEXT					not null
	cAddress3	Custimer's District	TEXT					not null
	cAddress4	Customer's Current Detailed Address	TEXT					not null
	cPhoneNumber	Customer's Phone Number	NUMBER					not null
	cBirthDate	Customer's Birth Date	DATETIME					not null
	cEmailAddress	Customer's Email Address	TEXT					not null
	cUserName	Customer's username	TEXT					not null
	cPassword	Customer's Account Password	TEXT					not null
	cSecurityQuestion	Customer's Security Question	TEXT					not null
	cSecurityAnswer	Customer's Security Answer	TEXT					not null
	cLogtime	Customer's Log Time	DATETIME					not null
	MembershipID	Unique Membership ID	TEXT	B####	B0001-B9999	FK	Membership	not null
	OfflineBookStoreID	Unique Offline Bookstore ID	TEXT	M####	M0001-M9999	FK	OfflineBookStore	
	Webname	Online Bookstore's Web Name	TEXT			FK	OnlineBookStore	
Membership	MembershipID	Unique Membership ID	TEXT	B####	B0001-B9999	PK		not null
	mLevel	Membership's level	NUMBER	0	0-3			not null
	mDiscount	Membership's discount	NUMBER	10%	0-100%			not null
	mTotalExpenditure	Membership's accmulated total expenses	NUMBER					not null
	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	FK	Customer	not null

Order	OrderID	Unique Order ID	TEXT	C####	C0001-C9999	PK		not null
	oDate	Order's Occur Date	TIMEDATE					not null
	oType	Order's Type	TEXT		ONLINE/OFFLINE			not null
	Delivery	Whether Need Deliver Service	YESNO					not null
	ReceiverPhoneNumbe	Receiver's Phone Number	NUMBER					not null
	ReceiverAddress	Receiver's Address	TEXT					not null
	ReceiverName	Receiver's Name	TEXT					not null
	oTotalPrice	Total Price of Order	NUMBER					not null
	Remark	Order's Remark For Special Requirements	TEXT					
	StaffID	Unique Staff ID	TEXT	D####	D0001-D9999	FK	Staff	not null
	BookID	Unique Book ID	TEXT	E####	E0001- E9999	FK	Book	not null
	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	FK	Customer	not null
	MembershipID	Unique Membership ID	TEXT	B####	B0001-B9999	FK	Membership	not null
Transaction	TranscationID	Unique Transaction ID	TEXT	F####	F0001-F9999	PK		not null
	PaymentMethod	Whether Payment Is Online or Offline	TEXT		ONLINE/OFFLINE			not null
	tTotalPrice	Total Price of Transaction	NUMBER					not null
	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	FK	Customer	not null
	OrderID	Unique Order ID	TEXT	C####	C0001-C9999	FK	Order	not null
	Poststatus	Whether The Books Have Been Sent	TEXT					not null
	Recevstatus	Whether The Books Have Been Received	TEXT					not null

Staff	StaffID	Unique Staff ID	TEXT	D####	D0001-D9999			not null
	sFirstName	Staff's First Name	TEXT					not null
	sLastName	Staff's Last Name	TEXT					not null
	sPhoneNumber	Staff's Phone Number	NUMBER					not null
	sGender	Staff's Gender	TEXT		Male/ Female/ Not Disclosure			not null
	sDepartment	Staff's Department	TEXT					not null
	sCapacity	Staff's Capacity	TEXT					not null
	sAddress1	Staff's Province	TEXT					not null
	sAddress2	Staff's City	TEXT					not null
	sAddress3	Staff's District	TEXT					not null
	sAddress4	Staff's Current Detailed Address	TEXT					not null
	sAccount	Staff's Account	TEXT					not null
	sPassword	Staff's Account Password	TEXT					not null
	OfflineBookStoreID	Unique Offline Bookstore ID	TEXT	H####	H0001-H9999	FK	OfflineBookStore	
Book	BookID	Unique Book ID	TEXT	E####	E0001- E9999	PK		not null
	bCategoryID	Book's Category ID	TEXT	I####	I0001-I9999			not null
	bName	Book's Name	TEXT					not null
	bPublishTime	Book's Publish Time	DATETIME					not null
	bPress	Book's Press	TEXT					not null
	bAuth_FirstName	Book Author's First Name	TEXT					not null
	bAuth_LastName	Book Author's Last Name	TEXT					not null
	bCategoryName	Book's Category Name	TEXT					not null
	bViews	Book's Total Views	NUMBER					not null
	bPrice	Book's Price	NUMBER					not null
	bStoreamount	Book's Storage Amount	NUMBER					not null
	bMonthlySales	Book's Monthly Sales	NUMBER					not null
	bvolume	Book's Total Sales	NUMBER					not null
	bIntroduction	Book's Introduction	TEXT					not null
	btranslator	Book's Translator	TEXT					
	bMprice	Book's Market Price	NUMBER					not null
	bstoretime	Book's Stored Time	DATETIME					not null
	bComment	Book's Comments	TEXT					not null

After sale Service	AfterSaleServiceID	Unique Aftersale ID	TEXT	J####	J0001-J9999	PK		not null
	Refund	Whether Customer Need Refund	YESNO					not null
	Barter	Whether Customer Need Change For A New Bo	YESNO					not null
	OrderID	Unique Order ID	TEXT	C####	C0001-C9999	FK	Order	not null
Comment	CommentID	Unique Comment ID	TEXT	K####	K0001-K9999	PK		not null
	Cdate	Comment's Date	DATETIME					not null
	StaffFeedback	Feedback For Staff's Service	TEXT					not null
	BookFeedback	Feedback For Book	TEXT					not null
	StaffRating	Staff Feedback Rating	NUMBER	7				not null
	BookRating	Book Feedback Rating	NUMBER	7				not null
	OverallRating	Overall Feedback Rating	NUMBER	7	1-10			not null
	StaffID	Unique Staff ID	TEXT			FK	Staff	not null
	BookID	Unique Book ID	TEXT			FK	Book	not null
	OrderID	Unique Order ID	TEXT	C####	C0001-C9999	FK	Order	not null
Offline BookStore	OfflineBookStoreID	Unique Offline Bookstore ID	TEXT	M####	M0001-M9999	PK		not null
	StoreAddress1	Offline Bookstore's Province	TEXT					not null
	StoreAddress2	Offline Bookstore's City	TEXT					not null
	StoreAddress3	Offline Bookstore's District	TEXT					not null
	StoreAddress4	Offline Bookstore's Current Detailed Adress	TEXT					not null
	StorePhoneNumber	Offline Bookstore's Phone Number	NUMBER					not null
	StaffNumber	Offline Bookstore's Staff Number	NUMBER					not null
	StoreManager	Offline Bookstore's Manager	TEXT					not null
	Postcode	Offline Bookstore's Postcode	NUMBER					not null
	StaffID	Unique Staff ID	TEXT	D####	D0001-D9999	FK		not null

Online BookStore	Webname	Online Bookstore's Web Name	TEXT			PK		not null
	Weblogo	Online Bookstore's Web Logo	TEXT					not null
	Website	Online Bookstore's Website	TEXT	www.###.com				not null
	Shopstream	Online Bookstore's Shop Stream	TEXT	Browse→Select→Pay through Shopping Cart				not null
	Worktime	Online Bookstore's Work Time	DATETIME					not null
	Commque	Online Bookstore's Common Questions	TEXT	How to pay? Whether Support Alipay?				not null
	Dealrule	Online Bookstore's Deal Rule	TEXT	Barter For No reason In 7 Days				not null
	Law	Online Bookstore's Law	TEXT	《刑法》《民法通则》				not null
	PhoneNumber	Online Bookstore's Phone Number	NUMBER					not null
	StoreManager	Online Bookstore's Manager	NUMBER					not null
	StaffID	Unique Staff ID	TEXT	D####	D0001-D9999	FK	Staff	not null
ShoppingCart	ShoppingCartID	Unique Shopping Cart ID	TEXT	S####	S0001-S9999	PK		not null
	sBookAmount	Shopping Cart's Book Amount	NUMBER					not null
	sTotalPrice	Shopping Cart's Total Price	NUMBER					not null
	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	FK	Customer	not null
	BookID	Unique Book ID	TEXT	E####	E0001- E9999	FK	Book	not null
Logistic	DeliveryID	Unique Delivery ID	TEXT	G####	G0001-G9999	PK		not null
	lName	Logistic Company's Name	TEXT					not null
	lAddress1	Logistic Company's Province	TEXT					not null
	lAddress2	Logistic Company's City	TEXT					not null
	lAddress3	Logistic Company's District	TEXT					not null
	lAddress4	Logistic Company's Detailed Address	TEXT					not null
	lPhoneNumber	Logistic Company's Phone Number	NUMBER					not null
	StaffID	Unique Staff ID	TEXT	D####	D0001-D9999	FK	Staff	not null
	OrderID	Unique Order ID	TEXT	C####	C0001-C9999	FK	Order	not null
Preference	Preference ID	Unique preference ID	TEXT	L####	L0001-L9999	PK		not null
	PurBooksCate	Customer's Purchased Book Categories	TEXT	Science Fiction				not null
	PurBookTopc	Customer's Purchased Book Topics	TEXT	WW II				not null
	PurBooksAuth	Customer's Purchased Book Authors	TEXT					not null
	PurBooksLan	Customer's Purchased Book Languages	TEXT					not null
	PurBooksTran	Customer's Purchased Book Translators	TEXT					
	CustomerID	Unique Customer ID	TEXT	A####	A0001-A9999	FK	Customer	not null
	PurNumCate	Number of Customer's Purchased Book Categor	NUMBER					not null

SECTION 2: Data Implementation and Data Sample

1. Table of Customer

```
CREATE TABLE Customer(
CustomerID TEXT PRIMARY KEY,
cFirstName TEXT,
cLastName TEXT,
cAge NUMBER,
cGender TEXT,
cAddress1 TEXT,
cAddress2 TEXT,
cAddress3 TEXT,
cAddress4 TEXT,
cPhoneNumber NUMBER,
cBirthDate DATETIME,
cEmailAddress TEXT,
cPassword TEXT,
cUserName TEXT,
cSecurityQuestion TEXT,
cSecurityAnswer TEXT,
CustomerLogTime DATETIME,
Membership YESNO)
Webname TEXT REFERENCES OnlineBookStore(Webname));
```

CustomerID	cFirstName	cLastName	cAge	cGender	cPhoneNumb
A0001	Qirui	XIANG	60	Male	137062182
A0002	Qiwei	WANG	55	Female	123456829
A0003	Tui	HONG	50	Female	132452857
A0004	Dui	TANG	45	Male	123452348
A0005	Taolong	ZHONG	40	Male	109487371
A0006	Yushen	TONG	35	Female	102948575
A0007	Xiaopeng	NING	38	Male	185849192
A0008	Wulong	BO	35	Female	141245555
A0009	Shuihua	ZHAN	34	Male	158219481
A0010	Wuchen	BO	30	Male	123318581
A0011	Taoshen	WANG	26	Male	152312401
A0012	Toubo	XIN	22	Male	152113311
A0013	Tuwen	LONG	26	Female	159012129
A0014	Tengbo	ZHEN	25	Female	152814919
A0015	Tengxun	ZHENG	30	Female	152831991
A0016	Wanghu	XIANG	34	Male	131249491
A0017	Zhangzhang	WANG	32	Male	122321312
A0018	Tonghu	ZHANG	29	Female	123213334
A0019	Keke	Li	31	Female	196841322
A0020	Kuaile	Pu	30	Female	185943938
A0021	Mo	zhu	30	Male	122213123

cBirthDate	cEmailAddress	cPassword	cUserName	cSecurityQues	cSecurityAns
1959-03-14	2184198@qq.c	a5991292	alley	Dog name	Allex
1954-05-24	s1e3@sad.com	a2859302	betty	First baby n	Alex
1959-05-21	s311@sad.com	b3921934	adrewr	Current city	Hunan
1964-05-17	s23133@qq.co	c482920sd	cellty	Dog name	Bex
1969-06-15	ssqqw123@163	sd1231asd	demmo	Dog name	Coodnm
1974-08-02	ssio@163.com	121asd12	demoasa	Current city	Anhui
1971-07-16	ss131@360.co	sd1d1ssa1	art	Birth City	Jiangsu
1974-05-20	ss@soho.com	23141sdzx	muscissi	Favourtie Co	Yellow
1975-08-17	8129@163.com	12132dasc	cooldom	Favourite Co	Wihte
1979-05-16	1121@youcam.	dsad12e123	fetty	Primary scho	Huhu
1983-09-20	123sa@wad.co	21321dsadas	coneree	Scondary sch	Kunan
1987-05-22	1231@youtbue	123123ads	fancy	Favourite co	Nike
1983-09-13	12313@gmail.	sad13131	pumplit	First Home	Kancheng
1984-05-31	safq@gmail.c	1221313aa	coooer	Favourite Au	Qirui
1979-05-30	q11@sailing.	a1321aasa1	cunmoer	Favourtie Au	Xiangge
1975-05-29	2112@163.com	a111231asa	huhuhuww	Facourtie Bo	Hehsan
1977-07-19	s13131@163.c	b1232131s	wwuhuaaa	Birth City	Xian
1980-04-16	ss91231@sohu	c123213az	oopippoer	Dog name	OLOS
1978-03-21	192139@qq.co	xad1212311	minumuner	Birth City	Hanzhou
1979-09-07	1283199@qq.c	sadg123124	poqiiaaaz	Cat name	Kitty
1979-04-23	23xx13@qq.co	sadxcaq123	pupuer	Cat name	Sunny

CustomerLogT	Membership	OfflineBookSt	Webname	cAddress1	cAddre
2019-04-29	0	M0001	RGNB	Zhejiang	Ningbo
2019-04-17	0	M0002	RGNB	Zhejiang	Ningbo
2019-04-17	-1	M0001	RGNB	Zhejiang	Ningbo
2019-04-16	-1	M0003	RGNB	Zhejiang	Ningbo
2019-04-15	-1	M0001	RGNB	Zhejiang	Ningbo
2019-03-20	-1	M0002	RGNB	Zhejiang	Ningbo
2019-03-20	-1	M0003	RGNB	Zhejiang	Ningbo
2019-02-28	-1	M0002	RGNB	Zhejiang	Ningbo
2019-04-23	-1	M0001	RGNB	Zhejiang	Ningbo
2019-03-13	-1	M0003	RGNB	Zhejiang	Ningbo
2019-03-31	-1	M0001	RGNB	Zhejiang	Ningbo
2019-04-17	-1	M0002	RGNB	Zhejiang	Ningbo
2019-03-22	-1	M0001	RGNB	Zhejiang	Ningbo
2019-02-13	-1	M0003	RGNB	Zhejiang	Ningbo
2019-03-12	-1	M0001	RGNB	Zhejiang	Ningbo
2019-02-13	-1	M0001	RGNB	Zhejiang	Ningbo
2019-03-22	-1	M0003	RGNB	Zhejiang	Ningbo
2019-01-16	-1	M0001	RGNB	Zhejiang	Ningbo
2019-03-09	-1	M0001	RGNB	Zhejiang	Ningbo
2019-02-18	-1	M0002	RGNB	Zhejiang	Ningbo
2019-04-01	-1	M0003	RGNB	Zhejiang	Ningbo

cAddress3	cAddress4
Yinzhou	Tiantongnanl
Tianyi	Gutonglu 252
Yinzhou	Tiantongnanl
Haishu	Taikanglu 11
Yinzhou	Tiantongnanl
Tianyi	Tianyilu 019
Haishu	Taikanglu 19
Tianyi	Gutonglu 292
Haishu	Taikanglu 74
Haishu	Taikanglu 38
Yinzhou	Tiantongnanl
Tianyi	Gutonglu 582
Yinzhou	Tiantongnanl
Haishu	Taikanglu 92
Yinzhou	Tiantongnanl
Yingzhou	Yingzhou 829
Haishu	Taikanglu 53
Haishu	Taikanglu 19
Tianyi	Tianyilu 864
Tianyi	Tianyilu 812
Tianyi	Tianyilu 121

2. Table of Memberiship

```
CREATE TABLE Membership(
MembershipID TEXT PRIMARY KEY,
mLevel NUMBER,
mDiscount NUMBER,
mTotalExpenditure NUMBER,
CustomerID TEXT REFERENCES Customer(CustomerID));
```

MembershipID	mLevel	mDiscount	mTotalExpendi	CustomerID
B0001	1	0.1	200	A0001
B0002	1	0.1	250	A0002
B0003	1	0.1	550	A0003
B0004	1	0.1	660	A0004
B0005	1	0.1	750	A0005
B0006	1	0.1	600	A0006
B0007	1	0.1	700	A0007
B0008	1	0.1	850	A0008
B0009	2	0.2	1200	A0009
B0010	2	0.2	1300	A0010
B0011	2	0.2	1250	A0011
B0012	2	0.2	1255	A0012
B0013	2	0.2	1500	A0013
B0014	3	0.3	2500	A0014
B0015	3	0.3	2550	A0015
B0016	3	0.3	2550	A0016
B0017	3	0.3	2854	A0017
B0018	3	0.3	2500	A0018
B0019	3	0.3	2303	A0019
B0020	3	0.3	2052	A0020

3. Table of Order

```
CREATE TABLE Order(
OrderID TEXT PRIMARY KEY,
OrderDate DATETIME,
OrderType TEXT,
Delivery YESNO,
ReceiverPhoneNumber NUMBER,
ReceiverAddress TEXT,
ReceiverName TEXT,
TotalPrice NUMBER,
Remark TEXT,
BookID TEXT REFERENCES Book(BookID),
StaffID TEXT REFERENCES Staff(StaffID),
CusomterID TEXT REFERENCES Customer(CustomerID),
MembershipID TEXT REFERENCES Membership(MenbershipID));
```

OrderID	OrderDate	OrderType	Delivery	ReceiverPhone	ReceiverAddress
C0001	2019-03-01	OFFLINE	-1	13706218204	Tiantongnanl
C0002	2019-02-04	ONLINE	-1	12345682945	Gutonglu 252
C0003	2018-11-29	OFFLINE	-1	13245285721	Tiantongnanl
C0004	2019-02-04	ONLINE	-1	12345234810	Taikanglu 11
C0005	2019-01-28	OFFLINE	-1	10948737123	Tiantongnanl
C0006	2019-02-03	OFFLINE	-1	10294857523	Tianyilu 019
C0007	2019-03-02	OFFLINE	0	18584919239	Taikanglu 19
C0008	2019-01-28	ONLINE	0	14124555512	Gutonglu 292
C0009	2019-01-01	OFFLINE	-1	15821948113	Taikanglu 74
C0010	2019-01-24	OFFLINE	0	12331858193	Taikanglu 38
C0011	2019-02-16	ONLINE	-1	15231240141	Tiantongnanl
C0012	2019-02-11	OFFLINE	-1	15211331122	Gutonglu 582
C0013	2019-01-21	OFFLINE	-1	15901212993	Tiantongnanl
C0014	2019-02-03	OFFLINE	-1	15281491941	Taikanglu 92
C0015	2019-01-08	ONLINE	0	15283199141	Tiantongnanl
C0016	2019-03-01	ONLINE	-1	12321333441	Taikanglu 19
C0017	2019-02-26	ONLINE	-1	19684132212	Tianyilu 864
C0018	2019-02-10	OFFLNE	-1	18594393821	Tianyilu 812

ReceiverName	TotalPrice	Remark	BookID	StaffID	CustomerID
Qirui XIANG	58	The sooner t	E0016	D0001	A0001
Qiwei WANG	50		E0017	D0001	A0002
Tui HONG	100		E0018	D0002	A0003
Dui TANG	120	Please use S	E0001	D0003	A0004
Taolong ZHON	240		E0002	D0001	A0005
Yushen TONG	300		E0003	D0004	A0006
Xiaopeng NIN	150		E0004	D0005	A0007
Wulong BO	150	Late deliver	E0012	D0001	A0008
Shuihua ZHAN	70		E0013	D0002	A0009
Wuchen BO	64		E0014	D0007	A0010
Taoshen WANG	90	Please use S	E0015	D0008	A0011
Toubo XIN	61		E0005	D0009	A0012

MembershipID	mLevel	mDiscount	mTotalExpendi	CustomerID
B0001	1	0.1	200	A0001
B0002	1	0.1	250	A0002
B0003	1	0.1	550	A0003
B0004	1	0.1	660	A0004
B0005	1	0.1	750	A0005
B0006	1	0.1	600	A0006
B0007	1	0.1	700	A0007
B0008	1	0.1	850	A0008
B0009	2	0.2	1200	A0009
B0010	2	0.2	1300	A0010
B0011	2	0.2	1250	A0011
B0012	2	0.2	1255	A0012
B0013	2	0.2	1500	A0013
B0014	3	0.3	2500	A0014
B0015	3	0.3	2550	A0015
B0016	3	0.3	2550	A0016
B0017	3	0.3	2854	A0017
B0018	3	0.3	2500	A0018
B0019	3	0.3	2303	A0019
B0020	3	0.3	2052	A0020

4. Table of Transaction

```
CREATE TABLE Transaction(
TransactionID TEXT PRIMARY KEY,
PaymentMehod TEXT,
tTotalPrice NUMBER,
Poststatus YESNO,
Recevstatus YESNO,
CustomerID TEXT REFERENCES Customer(CustomerID),
OrderID TEXT REFERENCES Order(OrderID));
```

TransactionID	Poststatus	PaymentMehod	tTotalPrice	Recevstatus	CustomerID
F0001	-1	OFFLINE	58	-1	A0001
F0002	-1	ONLINE	50	-1	A0002
F0003	-1	OFFLINE	100	-1	A0003
F0004	-1	ONLINE	120	-1	A0004
F0005	-1	OFFLINE	240	-1	A0005
F0006	-1	OFFLINE	300	-1	A0006
F0007	-1	OFFLINE	150	-1	A0007
F0008	-1	ONLINE	150	-1	A0008
F0009	-1	OFFLINE	70	-1	A0009
F0010	-1	OFFLINE	64	-1	A0010
F0011	-1	ONLINE	90	-1	A0011
F0012	-1	OFFLINE	61	-1	A0012
F0013	-1	OFFLINE	53	-1	A0013
F0014	-1	OFFLINE	24	-1	A0014
F0015	-1	ONLINE	347	-1	A0015

OrderID
C0001
C0002
C0003
C0004
C0005
C0006
C0007
C0008
C0009
C0010
C0011
C0012
C0013
C0014
C0015

5. Table of Staff

```
CREATE TABLE Staff(
StaffID TEXT PRIMARY KEY,
sFirstName TEXT,
sLastName TEXT,
sPhoneNumber NUMBER,
sGender TEXT,
sDepartment TEXT,
sCapacity TEXT,
sAddress1 TEXT,
sAddress2 TEXT,
sAddress3 TEXT,
sAddress4 TEXT,
sAccount TEXT,
sPassword TEXT,
OfflineBookStoreID TEXT REFERENCES OfflineBookStore(OfflineBookStoreID));
```

StaffID	sFirstName	sLastName	sPhoneNumber	sGender	sDepartment
D0001	Wild	WANG	13498762819	Male	management
D0002	Ying Yan	ZHANG	14537345743	Male	warehouse
D0003	Mulan	LI	15345340580	Male	Sales
D0004	Panxiang	HONG	13123213133	Male	Sales
D0005	mountain	ZHANG	15235345345	Female	Sales
D0006	Wind	XINAG	12414414414	Female	management
D0007	Visiting	LTIAN	12426486863	Female	Sales
D0008	Yuqing	TUN	14373930042	Male	Sales
D0009	Yingzhi	HUN	10494875748	Male	Sales
D0010	Drunk	ZHU	13674859403	Female	management
D0011	lotus	ZHI	14798739213	Female	Sales
D0012	Dong	HUO	13930304432	Male	Sales
D0013	Proud	NONG	14389248022	Female	warehouse
D0014	Convey	YU	13387469833	Female	Sales
D0015	Yishan	BING	13708612444	Male	warehouse

sCapacity	sAccount	sPassword	OfflineBookSt	sAddress1
Manager	a59912920	a1232151	M0001	Zhejiang
Warehouse M	a59912921	ax23123	M0001	Zhejiang

6. Table of Book

```
CREATE TABLE Book(
BookID TEXT PRIMARY KEY,
bCategoryID TEXT,
bName TEXT,
bPublishTime DATETIME,
bPress TEXT,
bAuth_FirstName TEXT,
bAuth_LastName TEXT,
bCategoryName TEXT,
bViews NUMBER,
bPrice NUMBER,
bStoreamount NUMBER,
bMonthlySales NUMBER,
bIntroduction TEXT,
bvolume NUMBER,
btranslator TEXT,
bMprice NUMBER,
bstoretime DATETIME,
bComment TEXT);
```

Book ID	bCategoryID	bName	bPublishTime	bPress	bAuth_FirstN
E0001	I0001	little Princ	2015-12-06	Anhui People	Flying
E0002	I0005	siege	2015-05-16	Beijing Publ	feather
E0003	I0120	Alive	2015-06-22	Changchun Pu	Rongcheng
E0004	I0005	a kite chase	2014-05-21	Chongqing Pu	Dragon
E0005	I0001	The forest i	2014-08-17	Party Buildi	Yoko
E0006	I0421	Unbearable	2012-08-16	Law Publishe	Rogue
E0007	I0120	White night	2008-09-07	Hunan People	If ice
E0008	I0001	How much do	2016-09-21	Jilin Publis	Lin
E0009	I0005	The Da Vinci	2010-05-28	Jiangsu Peop	Tolong
E0010	I0421	Dream of the	2015-08-17	Jiangxi Peop	Rongmei
E0011	I0111	1988: I want	2009-05-27	People's Lib	wild
E0012	I0120	Why are you	2005-05-05	Economic sci	Qingyun
E0013	I0005	Jane Eyre	2014-05-18	Kyushu Publi	Zuji
E0014	I0001	Pride and Pr	2009-02-13	Qingdao Publ	country
E0015	I0123	Harry Potter	2015-03-05	Shandong Peo	Ni Kuang
E0016	I0005	Ordinary wor	2006-03-04	Commercial P	Yunxiao
E0017	I0135	Procrastinat	2014-02-06	Shanghai Peo	Wild donkey
E0018	I0135	tolerant	2013-03-12	Hunan People	Jun
E001	I0005	Camellia	2015-02-	Jilin	star

bAuth_LastNam	bCategoryName	bViews	bPrice	bStoreamount	bMonthlySale
Money	Art	32131	56	114	54
Sun	Literature	5131	31	121	24
Lee	Science	1234	31	31	63
Week	Literature	12014	51	53	14
Wu	Art	51014	54	67	25
Zheng	History	12313	24	161	36
King	Science	4552	52	53	26
Feng	Art	34331	14	63	57
Chen	Literature	3123	51	151	2
Zhu	History	3321	35	115	15
Wei	Geography	31312	31	124	24
Jiang	Science	4414	112	121	12
Shen	Literature	1014	63	112	24
Yang	Art	5151	42	21	15
Zhu	Geography	6432	65	25	14
Qin	Literature	4145	26	15	16
Chun	Education	34324	75	16	47
Xu	Education	112311	53	15	53
He	Literature	4242	63	16	14
Lu	Military	41213	24	37	55

bIntroduction	bvolume	btranslator	bMprice	bstoretime	bComment
I once saws	522		60	2019-04-16	This book is
Reading can	622		29	2019-04-10	This book is
Reading can	242		68	2019-04-17	Real book is
How to know	622	Qian Zhongsh	19	2019-03-13	I don't like
How to live	644	Qian Liqun	30	2019-03-08	This book is
The benefits	855		41	2019-03-09	This book is
Reading can	522		31	2019-02-08	This book is
Culture, or	622		62	2019-03-09	I like this
The name and	411	Qin	7	2019-03-24	I recommend
The inventio	532		20	2019-03-25	I don't reco
For those wh	631	Captain	29	2019-04-15	Real book is
The ideas in	631		17	2019-03-27	I don't like
The book tow	215		29	2019-04-12	This book is
The natural	262		20	2019-04-15	This book is
Make people'	631	Qi Mo	19	2019-04-07	I like this
Reading, mak	635		21	2019-04-27	I recommend
Feelings blo	853		52	2019-03-11	In the middl
Reading, so	512		58	2019-03-23	its fine
A door of	421		19	2019-03-	Poorly

7. Table of AfterSaleService

```
CREATE TABLE AfterSaleService(
AfterSaleServiceID TEXT PRIMARY KEY,
Refund YESNO,
Barter YESNO,
OrderID TEXT REFERENCES Order(OrderID));
```

AfterSaleServ	Refund	Barter	OrderID
J0001	-1	0	C0001
J0002	-1	0	C0002
J0003	0	-1	C0003
J0004	0	-1	C0004
J0005	-1	0	C0005
J0006	0	-1	C0006
J0007	0	-1	C0007

8. Table of Comment

```
CREATE TABLE Comment(
CommentID TEXT PRIMARY KEY,
Cdate DATETIME,
StaffFeedback TEXT,
BookFeedback TEXT,
BookRating NUMBER,
StaffRating NUMBER,
OverallRating NUMBER,
StaffID TEXT REFERENCES Staff(StaffID),
BookID TEXT REFERENCES Books(BookID),
OrderID TEXT REFERENCES Order(OrderID));
```

CommentID	Cdate	StaffFeedback	StaffRating	BookFeedback	BookRating
K0001	2019-03-07	Good service	7	Good reading	8
K0002	2019-02-02	Moderate ser	6	Medium readi	5
K0003	2019-04-18	Moderate ser	8	Medium readi	7
K0004	2019-04-08	Moderate ser	9	Good reading	8
K0005	2019-04-07	Good service	10	Good reading	9
K0006	2019-04-28	Moderate ser	5	Good reading	10
K0007	2019-05-01	Moderate ser	6	Medium readi	7
K0008	2019-04-02	Good service	8	Poor reading	4
K0009	2019-04-24	Poor service	3	Good reading	8
K0010	2019-03-10	Moderate ser	8	Good reading	10
K0011	2019-04-07	Good service	9	Good reading	10
K0012	2019-03-31	Good service	10	Medium readi	6
K0013	2019-03-25	Poor service	5	Good reading	8

OverallRating	OrderID	BookID	StaffID
8	C0001	E0016	D0001
6	C0002	E0017	D0001
8	C0003	E0018	D0002
9	C0004	E0001	D0003
9	C0005	E0002	D0001
7	C0006	E0003	D0004
7	C0007	E0004	D0005
6	C0008	E0012	D0001
6	C0009	E0013	D0002
8	C0010	E0014	D0007
9	C0011	E0015	D0008
7	C0012	E0005	D0009
7	C0013	E0006	D0004
3	C0014	E0007	D0005
5	C0015	E0008	D0003

9. Table of OfflineBookStore

```
CREATE TABLE OfflineBookStore(
OfflineBookStoreID TEXT PRIMARY KEY,
StoreAddress1 TEXT,
StoreAddress2 TEXT,
StoreAddress3 TEXT,
StoreAddress4 TEXT,
StorePhoneNumber NUMBER,
StaffNumber NUMBER,
StoreManager TEXT,
Postcode NUMBER,
StaffID TEXT REFERENCES Staff(StaffID));
```

OfflineBookSt	StorePhoneNum	StaffNumber	StoreManager	Postcode	StaffID
M0001	86990452	30	Wild WANG	315000	D0001
M0002	89440251	25	Wind XIANG	315000	D0006
M0003	89400204	28	Drunk ZHU	315000	D0010

StoreAddress1	StoreAddress2	StoreAddress3	StoreAddress
Zhejiang	Ningbo	Yinzhou	Tiantongnanl
Zhejiang	Ningbo	Tianyi	Tianyizhongl
Zhejiang	Ningbo	Hanshu	Hanshudadao

10. Table of OnlineBookStore

```
CREATE TABLE OnlineBookStore(
Webname TEXT PRIMARY KEY,
Weblogo TEXT,
Website TEXT,
Shopstream TEXT,
Worktime TEXT,
Commque TEXT,
Dealrule TEXT,
Law TEXT,
obsPhoneNumber NUMBER,
StoreManager TEXT,
StaffID TEXT REFERENCES Staff(StaffID));
```

Webname	Weblogo	Website	Shopstream	Worktime	Commque
RGNB	RGNB	www.rgnb.com	Browse → Sele	6AM → 4AM(+1d	Is Alipay su

Dealrule	Law	obsPhoneNumbe	StoreManager	StaffID
Refund for n	《网络交易管	##########	Drunk Zhu	D0010

11. Table of ShoppingCart

```
CREATE TABLE ShoppingCart(
ShoppingCartID TEXT PRIMARY KEY,
BookAmount NUMBER,
scTotalPrice NUMBER,
CustomerID TEXT REFERENCES Customer(CustomerID),
BookID TEXT REFERENCES Book(BookID));
```

ShoppingCart	IBookAmount	scTotalPrice	CustomerID	BookID
S0001	1	20	A0001	E0020
S0002	1	20	A0002	E0001
S0003	1	52	A0003	E0002
S0004	1	78	A0004	E0003
S0005	1	83	A0005	E0004
S0006	1	51	A0006	E0005
S0007	1	84	A0007	E0006
S0008	1	94	A0008	E0007
S0009	1	41	A0009	E0008
S0010	1	20	A0010	E0009
S0011	1	50	A0011	E0010
S0012	1	42	A0012	E0017
S0013	1	83	A0013	E0018
S0014	1	20	A0014	E0019
S0015	1	24	A0015	E0011

12. Table of Logistic

```
CREATE TABLE Logistic(
DeliveryID TEXT PRIMARY KEY,
LogisticName TEXT,
LogisticAddress1 TEXT,
LogisticAddress2 TEXT,
LogisticAddress3 TEXT,
LogisticAddress4 TEXT,
LogisticPhoneNumber NUMBER,
StaffID TEXT REFERENCES Staff(StaffID),
OrderID TEXT REFERENCES Order(OrderID));
```

DeliveryID	LogisticName	LogisticPh	StaffID	OrderID	LogisticAddr
G0001	Yuantong	86990306	D0001	C0001	Zhejiang
G0002	Shunfeng	86773812	D0012	C0002	Zhejiang
G0003	Youzhen	86990306	D0012	C0003	Zhejiang
G0004	Yuantong	88761233	D0011	C0004	Zhejiang
G0005	Youzhen	86990306	D0009	C0005	Zhejiang
G0006	Jingdong	85612133	D0001	C0006	Zhejiang
G0007	Shunfeng	86773812	D0008	C0009	Zhejiang
G0008	Yuantong	88761233	D0009	C0011	Zhejiang
G0009	Jingdong	85612133	D0012	C0012	Zhejiang
G0010	Youzhen	86990306	D0001	C0013	Zhejiang
G0011	Shunfeng	86773812	D0015	C0014	Zhejiang
G0012	Yuantong	88761233	D0002	C0015	Zhejiang
G0013	Shunfeng	86773812	D0001	C0016	Zhejiang
G0014	Youzhen	86990306	D0001	C0017	Zhejiang
G0015	Yuantong	88761233	D0004	C0018	Zhejiang

LogisticAddre	LogisticAddre	LogisticAddre
Ningbo	Yinzhou	Yinzhoulu 11
Ningbo	Haiding	Haidingllu 2
Ningbo	Yinzhou	Yinzhoulu 11
Ningbo	Tianyi	Tianyi 250
Ningbo	Yinzhou	Yinzhoulu 11
Ningbo	Haishu	Haishu 204
Ningbo	Haiding	Haidingllu 2
Ningbo	Tianyi	Tianyi 250
Ningbo	Haishu	Haishu 204
Ningbo	Yinzhou	Yinzhoulu 11
Ningbo	Haiding	Haidingllu 2
Ningbo	Tianyi	Tianyi 250
Ningbo	Haiding	Haidingllu 2
Ningbo	Yinzhou	Yinzhoulu 11
Ningbo	Tianyi	Tianyi 250

13. Table of Preference

```
CREATE TABLE Preference(
PreferenceID TEXT PRIMARY KEY,
PurBooksCate TEXT,
PurBookTopc TEXT,
PurBooksAuth TEXT,
PurBooksLan TEXT,
PurBooksTran TEXT,
PurNumCate NUMBER,
CustomerID TEXT REFERENCE Customer(CustomerID));
```

Section3: Queries and Reports

1. List all customers whose total expenditure exceed $2000

Customer Relationship Manager: View the information of Customers' whose total expenditure exceed $2000. The purpose is to find out the most valuable customers, provide them with special service and further promote their shopping experience.

```
SELECT Customer.CustomerID, Customer.cFirstName, Customer.cLastName, Membership.MembershipID, Membership.mLevel, Membership.mTotalExpenditure
FROM Customer INNER JOIN Membership ON Customer.CustomerID= Membership.CustomerID
WHERE Membership.mTotalExpenditure > 2000
ORDER BY Membership.mTotalExpenditure;
```

CustomerID	cFirstName	cLastName	Membership	mLevel	mTotalExper
A0020	Kuaile	Pu	B0020	3	2052
A0019	Keke	Li	B0019	3	2303
A0018	Tonghu	ZHANG	B0018	3	2500
A0014	Tengbo	ZHEN	B0014	3	2500
A0016	Wanghu	XIANG	B0016	3	2550
A0015	Tengxun	ZHENG	B0015	3	2550
A0017	Zhangzhang	WANG	B0017	3	2854

2. List all comments with overall rating below or equal to 5

After-sale Service Manager: View the comments which have overall rating below or equal to 5. Through looking through the comments of low rating books, managers can figure out the reasons for the low marks and derive rational improvements. For example, decrease the stock of low-rating books.

```
SELECT CommentID, Cdate, StaffFeedback, BookFeedback, OverallRating,
OrderID
FROM Comment
WHERE OverallFeedback <= 5;
```

CommentID	Cdate	StaffFeedba	BookFeedba	OverallRatin	OrderID
K0014	06/04/2019	Poor service at	Poor reading e	3	C0014
K0015	29/04/2019	Moderate servi	Medium readir	5	C0015

3. List all books with rating exceed or equal to 7

Book Store Manager: Find out books with rating exceed or equal to 7. The purpose is to find out the books with high quality which could be recommended on the homepage of online store. In addition, these books can also be placed at the most conspicuous position in offline bookstores. According to the rating, managers can also increase the stock of corresponding books.

```
SELECT Book.BookID, Book.bCategoryName, Book.bName,
Book.bAuth_FirstName, Book.bAuth_LastName, Comment.BookFeedback,
Comment.BookRating, Comment.OverallRating
FROM Book
INNER JOIN Comment
ON Book.BookID=Comment.BookID
WHERE Comment.BookRating >=7
ORDER BY Comment.BookRating;
```

BookID	bCategoryNa	bName	bAuth_First	bAuth_Last	BookFeedba	BookRating	OverallRatin
E0004	Literature	a kite chaser	Dragon	Week	Medium readir	7	7
E0018	Education	tolerant	Jun	Xu	Medium readir	7	8
E0006	History	Unbearable ligh	Rogue	Zheng	Good reading e	8	7
E0013	Literature	Jane Eyre	Zuji	Shen	Good reading e	8	6
E0001	Art	little Prince	Flying	Money	Good reading e	8	9
E0016	Literature	Ordinary world	Yunxiao	Qin	Good reading e	8	8
E0002	Literature	siege	feather	Sun	Good reading e	9	9
E0015	Geography	Harry Potter an	Ni Kuang	Zhu	Good reading e	10	9
E0014	Art	Pride and Preju	country	Yang	Good reading e	10	8
E0003	Science	Alive	Rongcheng	Lee	Good reading e	10	7

4. List all books with the highest monthly selling and their comments

Book Store Manager: View the books with the highest monthly selling and corresponding comments. This aims at finding out the most popular books and recommending them to customers.

```
SELECT Book.BookID, Book.bCategoryName, Book.bName, Book.bViews,
Book.bAuth_FirstName, Book.bAuth_LastName, Book.bMonthlySales,
Book.bVolume, Comment.BookFeedback, Comment.BookRating
FROM Book
INNER JOIN Comment
ON Book.BookID=Comment.BookID
ORDER BY Book.bMonthlySales;
```

BookID	bCategoryName	bName	bViews	bAuth_First	bAuth_Last	bMonthlySal	bVolume	BookFeedba	BookRating
E0012	Science	Why are you si	4414	Qingyun	Jiang	12	631	Poor reading e	4
E0015	Geography	Harry Potter an	6432	Ni Kuang	Zhu	14	631	Good reading e	10
E0004	Literature	a kite chaser	12014	Dragon	Week	14	622	Medium readir	7
E0014	Art	Pride and Preju	5151	country	Yang	15	262	Good reading e	10
E0016	Literature	Ordinary world	4145	Yunxiao	Qin	16	635	Good reading e	8
E0013	Literature	Jane Eyre	1014	Zuji	Shen	24	215	Good reading e	8
E0002	Literature	siege	5131	feather	Sun	24	622	Good reading e	9
E0005	Art	The forest in N	51014	Yoko	Wu	25	644	Medium readir	6
E0007	Science	White night lin	4552	If ice	King	26	522	Poor reading e	3
E0006	History	Unbearable ligl	12313	Rogue	Zheng	36	855	Good reading e	8
E0017	Education	Procrastination	34324	Wild donkey	Chun	47	853	Medium readir	5
E0018	Education	tolerant	112311	Jun	Xu	53	512	Medium readir	7
E0001	Art	little Prince	32131	Flying	Money	54	522	Good reading e	8
E0008	Art	How much do y	34331	Lin	Feng	57	622	Medium readir	5
E0003	Science	Alive	1234	Rongcheng	Lee	63	242	Good reading e	10

5. List all staff with rating below or equal to 5

Book Store Manager: Find out staffs with rating below or equal to 5. The purpose is to find out the staffs with misbehavior or provide poor service to customers. Managers can consider punishing or dismissing these staff.

```
SELECT Staff.StaffID, Staff.sFirstName, Staff.sLastName,
Staff.sDepartment, Comment.StaffFeedback, Comment.StaffRating,
Comment.OverallRating

FROM Staff

INNER JOIN Comment

ON Staff.StaffID=Comment.StaffID

WHERE Comment.BookRating <=5

ORDER BY Comment.StaffRating;
```

StaffID	sFirstName	sLastName	sDepartmen	StaffFeedba	StaffRating	OverallRatin
D0005	mountain	ZHANG	Sales	Poor service at	3	3
D0003	Mulan	LI	Sales	Moderate servi	6	5
D0001	Wild	WANG	management	Moderate servi	6	6
D0001	Wild	WANG	management	Good service at	8	6

6. Update customer personal information

Customer Requirements: Customers need fully access to their own information and authority to change these data. The Customers need to log into their own account by username and password.

```
UPDATE Customer SET cPhoneNumber=1234567333

WHERE cUserName = 'alley'   AND cPassword = 'a5991292';
```

CustomerID	cFirstName	cLastName	cAge	cGender	cPhoneNum	cBirthDate	cEmailAddre	cPassword	cUserName
A0001	Qirui	XIANG	60	Male	1234567333	14/03/1959	2184198@qq.c	a5991292	alley

SECTION 4: Business Intelligence

Business intelligence is a set of technologies applied for the purpose of facilitating and enhancing corporate decision making. It obtains and collects information from large amounts of data. The store will apply it to investigate present business environment, predict consumer behaviors and adjust strategic management accordingly.

Method 1： Linear-regression analysis using Stata

The store attempts to explore the factors affecting an individual's expenditure on book purchase and adjust current resource allocation on factors that are most relevant with the sales if possible.

According to our assumptions, there are 3 major factors influencing every individual's total expenditure, which are gender, age, and the number of purchased book categories.

Our group originally added the discount rate as the fourth factor. Considering the relationship between discount and customer spending, it will cause endogeneity. Therefore, it cannot help to get conclusions and should be removed.

From the perspective of gender and age, these data aim to find

qualitative relationship and the categories are used to analyse quantitative relationships. Through identifying the relationship, the store could discover which book categories are welcomed by different age groups, consequently, it provides a solution to enhance recommendation in terms of consumers' purchase preferences.

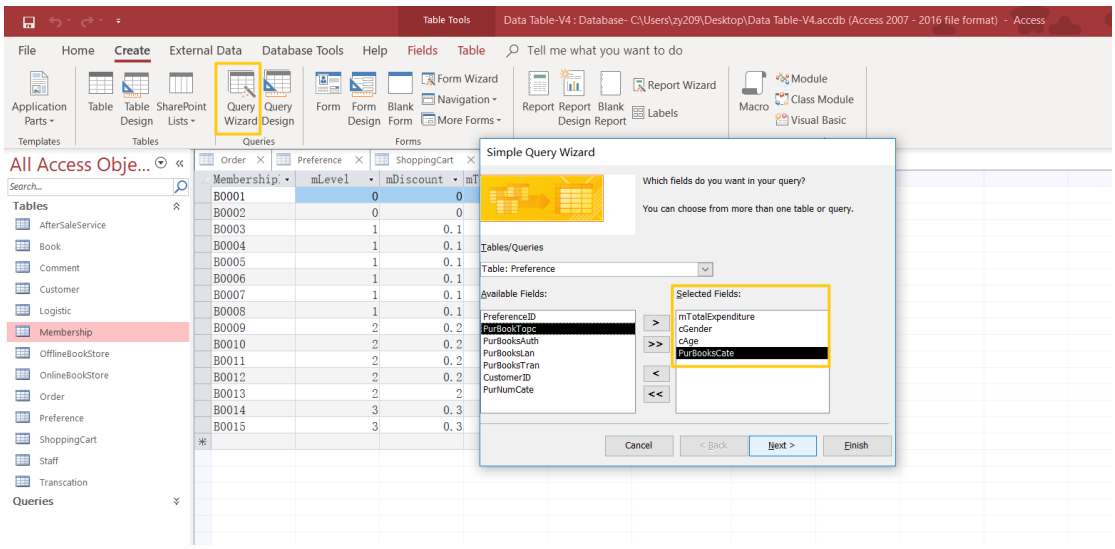
Step 1: Set the estimated model. The proposed relationship is shown below.

$$\text{Total expenditure} = \beta 1 + \beta 2 * \text{Gender} + \beta 3 * \text{Age} + \beta 4 * \text{Categories}$$

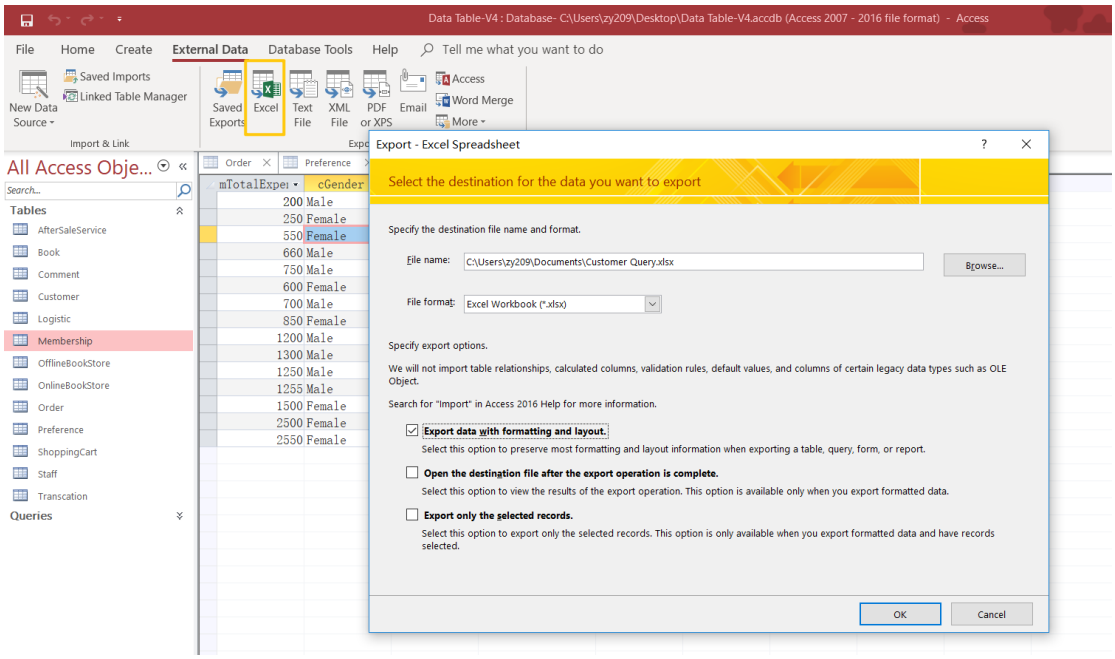
The dummy variable is gender. If equals to 1 if the customer is male, 0 if the customer is female.

Step 2: Extract related data from Access and transformed into Excel.

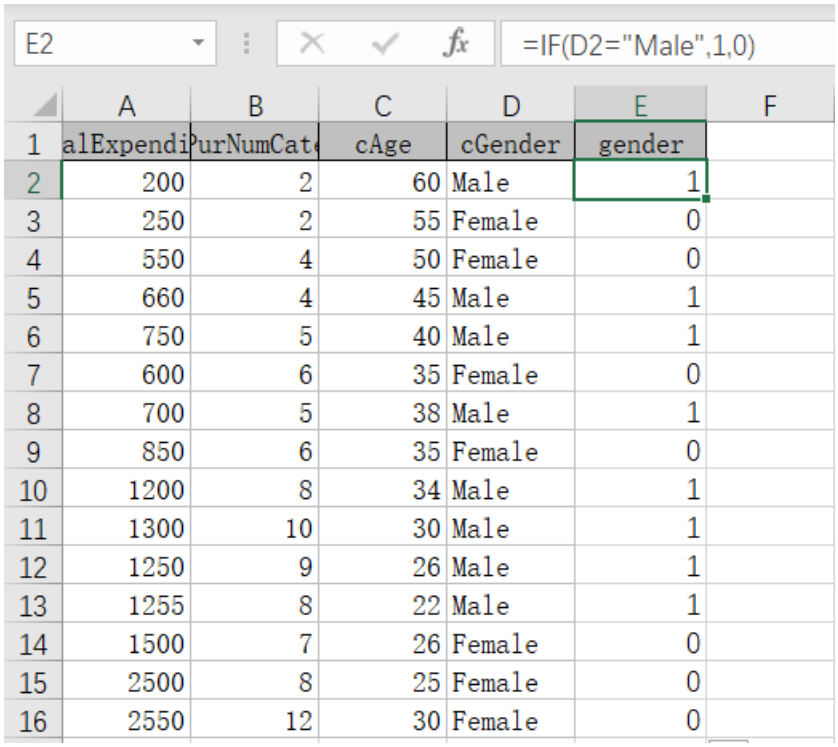
Create a query wizard with chosen data.



Then transform it into Excel.



As there exists a dummy variable, it is important to transfer it. In Excel, use “if” function to define 0 as male and 1 as female.



	A	B	C	D	E	F
1	alExpendi	urNumCat	cAge	cGender	gender	
2	200	2	60	Male	1	
3	250	2	55	Female	0	
4	550	4	50	Female	0	
5	660	4	45	Male	1	
6	750	5	40	Male	1	
7	600	6	35	Female	0	
8	700	5	38	Male	1	
9	850	6	35	Female	0	
10	1200	8	34	Male	1	
11	1300	10	30	Male	1	
12	1250	9	26	Male	1	
13	1255	8	22	Male	1	
14	1500	7	26	Female	0	
15	2500	8	25	Female	0	
16	2550	12	30	Female	0	

Step 3: Do regression analysis on Stata.

Before running any regressions, it is important to view the contents of the data set. Use "summarize" command to have an overview of useful information such as value of the variables, the standard deviation maximum and minimum values. This helps to discover outliers and extreme values in the dataset.

```
. summarize
```

Variable	Obs	Mean	Std. Dev.	Min	Max
mtotalexpe~e	15	1074.333	703.7016	200	2550
purnumcate	15	6.4	2.848559	2	12
cage	15	36.73333	11.40468	22	60
cgender	0				
gender	15	1.533333	.5163978	1	2

Use the "tabulate" command to analyse the dummy variable, gender. This result illustrates that customer gender distribution is average.

```
. tabulate cgender
```

cGender	Freq.	Percent	Cum.
Female	7	46.67	46.67
Male	8	53.33	100.00
Total	15	100.00	

Finally, use "regress" command.

```
. reg mtotalexpenditure cage purnumcate gender
```

Source	SS	df	MS		
Model	5325606.08	3	1775202.03	Number of obs	= 15
Residual	1607137.25	11	146103.387	F(3, 11)	= 12.15
				Prob > F	= 0.0008
				R-squared	= 0.7682
				Adj R-squared	= 0.7050
Total	6932743.33	14	495195.952	Root MSE	= 382.23

mtotalexpe~e	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
cage	-8.135233	16.54645	-0.49	0.633	-44.55372	28.28326
purnumcate	179.2865	66.24332	2.71	0.020	33.48594	325.0871
gender	-330.6936	197.8451	-1.67	0.123	-766.1477	104.7605
_cons	732.7974	1039.02	0.71	0.495	-1554.069	3019.664

Then the final equation is as follows.

Total expenditure = 732.8 - 330.7 * Gender -8.1 * cAge + 179.3 * PurNumCate.

From above equation and the results from Stata, it shows that this relationship has a strong explanatory power with R^2=0.77. The explained variable PurNumCate is significant at 10%, while other variables are not significant as they have multicollinearity.

Then, use "pwcorr" command to check the correlation among gender, the number of purchased book categories and age.

```
. pwcorr gender purnumcate cage
```

	gender	purnum~e	cage
gender	1.0000		
purnumcate	-0.0097	1.0000	
cage	0.0137	-0.8408	1.0000

This shows the number of purchased book categories and age has a strong relationship, while gender and age or the number of purchased book categories and gender does not.

Specifically, the coefficient of gender, -330.7, means that a female will spend 330.7￥ more than that of males in purchases. This gives clues for the store to push advertisements directly to females to increase revenue. The coefficient of age, -8.1, shows that people spend 8.1￥less for every additional year. According to this, it is worthwhile to recommend relative commodities for younger people as they have more potential to purchase.

In conclusion, consumers who are females in younger generations are willing to pay more, and the store could adjust strategy in terms of it.

Step 5: Limitations and evaluation.

Though the regression has strong explanatory power, there exists multicollinearity. It refers to the fact that the model estimates are distorted to estimate accurately due to the existence of high correlations between explanatory variables in linear regression models. Here it is the number of purchased book categories and age. One of the solutions is to exclude it and find other possible factors.

Additionally, the regression can only provide a relationship according to our assumption. However, it does not give accurate results or solutions. As a result, it could be considered as a reference but not a manual. The store needs other discoveries to revise its tactics.

Method 2: Data Visualisation

The data visualisation is a method to illustrate information effectively and clearly with well labelled graphs. The store could also have a better understanding of the trend and relationship instead of complex

and numerous data sets. In this case, we mainly use bubble charts to find the relationship among **sales of books, number of buyers and total sales.** The goal of this report is to provide insights into popular book categories and revenue enhancement.

Step 1: Use access to query book sales and customer id.

The SQL statements are shown as follows.

```
SELECT PurBooksCate, COUNT (*) AS PurNumCate
FROM Preference
GROUP BY PurBooksCate;
```

Query1 | Preference

PurBooksCate	PurNumCate
Art	4
Economic	2
Education	3
Literature	6
Military	2
Philosophy	3

In order to find the relationship with buyers and the purchased book categories, we ought to query them together (Customer (CustomerID) table and Preference (PurBookCate) table).

The SQL statements of number of buyers is as follows:

```
SELECT Preference.PreferenceID, Preference.PurBooksCate,
Customer.CustomerID, Customer.cFirstName, Customer.cLastName,
Customer.cPhoneNumber
FROM Preference
INNER JOIN Customer
ON Preference.CustomerID = Customer.CustomerID
ORDER BY Preference.PurBooksCate;
```

Preference	PurBooksCate	CustomerID	cFirstName	cLastName	cPhoneNumb
L0011	Art	A0011	Taoshen	WANG	15231240141
L0010	Art	A0010	Wuchen	BO	12331858193
L0020	Art	A0020	Kuaile	Pu	18594393821
L0017	Art	A0017	Zhangzhang	WANG	12232131222
L0008	Economic	A0008	Wulong	BO	14124555512
L0007	Economic	A0007	Xiaopeng	NING	18584919239
L0002	Education	A0002	Qiwei	WANG	12345682945
L0004	Education	A0004	Dui	TANG	12345234810
L0001	Education	A0001	Qirui	XIANG	13706218204
L0018	Literature	A0018	Tonghu	ZHANG	12321333441
L0012	Literature	A0012	Toubo	XIN	15211331122
L0013	Literature	A0013	Tuwen	LONG	15901212993
L0015	Literature	A0015	Tengxun	ZHENG	15283199141
L0016	Literature	A0016	Wanghu	XIANG	13124949141
L0019	Literature	A0019	Keke	Li	19684132212
L0014	Military	A0014	Tengbo	ZHEN	15281491941
L0003	Military	A0003	Tui	HONG	13245285721
L0009	Philosophy	A0009	Shuihua	ZHAN	15821948113
L0006	Philosophy	A0006	Yushen	TONG	10294857523
L0005	Philosophy	A0005	Taolong	ZHONG	10948737123

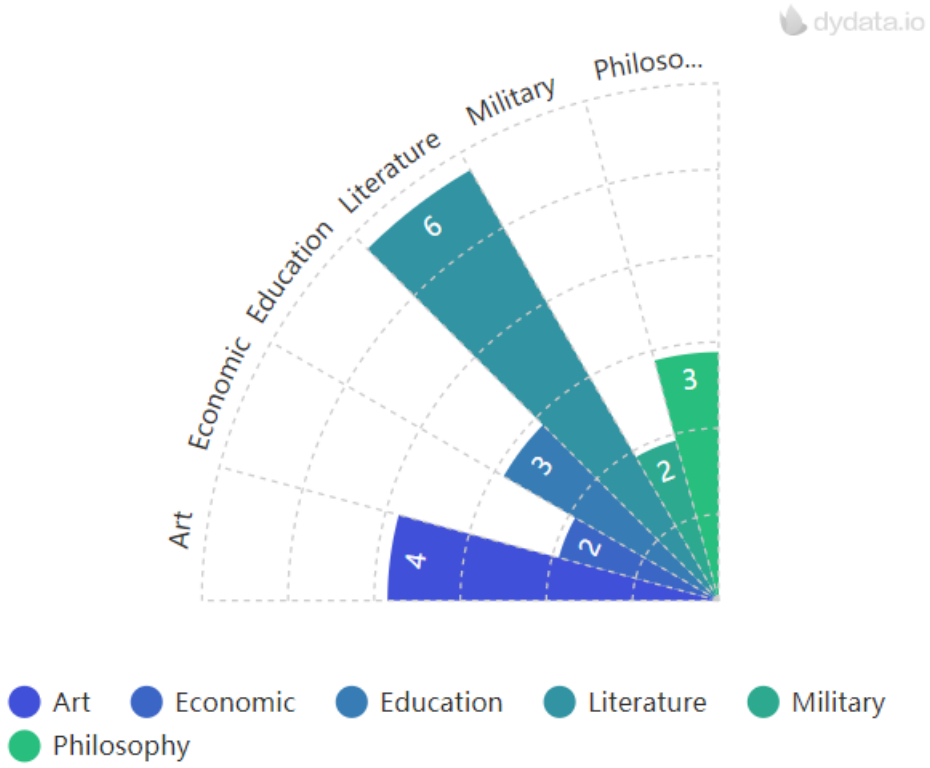
Step 2: Use Excel to analyze and draw the graph

Export above 2 datasets into Excel, and count the discount CustomerID as NumberofBuyers, and combine them together and get the following table:

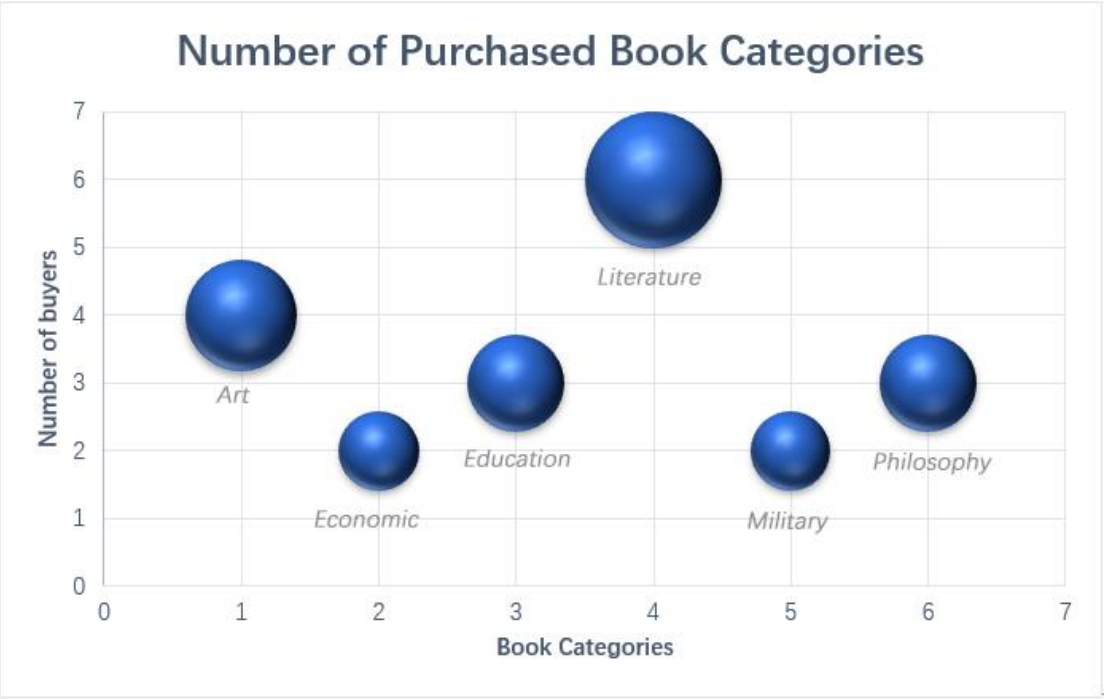
PurBooksCate	PurNumCate	NumberOfBuyers
Art	4	4
Economic	2	2
Education	3	3
Literature	6	6
Military	2	2
Philosophy	3	3

Next, to find the most popular book categories, which stand for the highest sales volume.

The Y-axis represents the number of buyers. The X-axis denotes for book categories, on which art, economic, education, literature, military and philosophy are labelled as 1, 2, 3, 4, 5, and 6 respectively. The sector chart is as follows.



The 3D bubble chart is as follows.



Above charts clearly represents that Literature is the most popular book category, while Economic and Military has the lowest popularity. According to this result, it indicates that, Literature are the top sales and are welcomed by most consumers. Due to its popularity, the store could regard it as a consumer attraction. In the offline store, put Literature books in the most conspicuous place and attracts attention. In the online store, use Literature books in the home page and recommend to new users. Additionally, after a purchase, the recommendation system could guess what the consumer like in order to increase the unit price.

Step 3: Limitations of data visualization

The data visualization represents information effectively and intuitively, though, it has some limits. If the data has little difference between different book categories, the charts displayed cannot help.

Furthermore, the sample size of data has impacts on data visualization. If the data size is too small, the results might not be representative for the whole circumstance and the predictions are not accurate. Thus, data viewers might not comprehensively see the whole picture and make wrong decisions.

SECTION 5: Conclusion

Advantages

The advantages of this system can be roughly categories as advantages for customers and for managers. Start with customer advantages, in this system, historical purchase is recorded through table 'Preference' in distinct details. Therefore, the advertisements in online store are highly differentiated and are designed based on customers' personal preferences. In addition, books are recommended to customers according to overall rating from comments. Through such method, the quality of books is assured and tested by the large group of other customers. Secondly, with the purpose of promoting retention rate, this system identifies the most valuable customers and provide them with special services, such as quick delivery. Furthermore, the membership system gives customers extra bonus and discounts which encourages members to accumulate more consumption. Thirdly, online customers can either make their order directly while browsing the products or through operating shopping cart, which increases flexibility of the purchase procedure.

The advantages for the managers are shown as following. Firstly, by collecting comments and rating of staff, bookstore managers could

punish or dismiss the staff with poor performance. Therefore, the bookstore can achieve higher efficiency, good reputation and corporate culture. Apart from better supervise staff, managers can also attain a clear understanding of books and overall customer shopping experience. Equipped with such information, managers will be able to flexibly adjust their selling strategy and service. The second point is regard with the consistency of orders. In our system, the information of orders from multi-channels are merge to a stage "order", which leads to less coordination cost on transferring the information.

Disadvantages

Though the database can cope with various business requirements, the limitation is still worth considering. Firstly, customers' purchase tendency is predicted based on a few attributes such as book categories. However, customers' behavior is more dynamic and less predictable in real life. Thus, a better model is needed for accurate prediction. The second limitation is that not every relationship between entities is displayed in the E-R diagram. Thirdly, cross-channel orders are arranged to same type of delivery, nonetheless offline customers may not expect the books purchased in the physical store to be delivered as slow as online shopping. The last and most important aspect lies on information security and concurrency problem. While many staffs will have the authority to access customer information, there is a probability of information leakage. Moreover, interleaving of operations may cause loss of update, uncommitted dependency and inconsistent analysis.

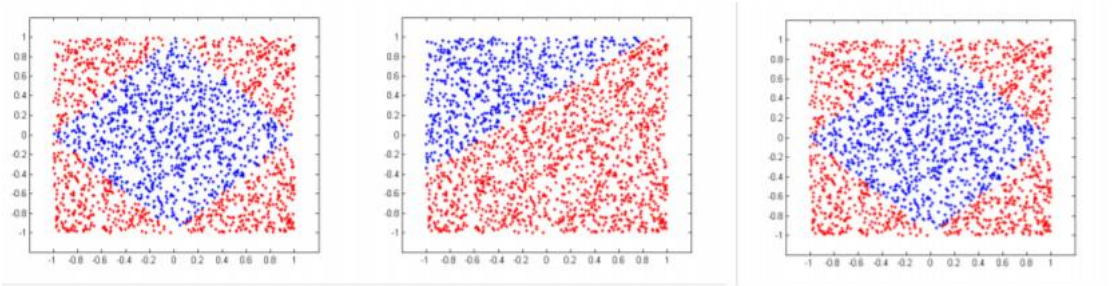
Improvements

Refer to the first limitation, better analytical models are expected for making wiser decisions. The MLR (Mixed Logistic Regression) is recommended to solve the problem. This model divides similar aspects of customers into various small regions, then conduct piece-wise linear regressions among these regions. Finally, combine the results as one non-linear model. In other words, the 'dynamic' problem is simplified by splitting the subject characteristic into small regions of characteristics. The model can be expressed as follow equation:

$$p(y=1|x) = g\left(\sum_{j=1}^{m} \sigma(u_j^T x)\eta(w_j^T x)\right)$$

(Gai etal, 2017)

'M' represents the number of small regions, when m=1 we get a linear regression model. To prove the case, Gai etal (2017) ran a binary classification problem, the results are as follows:



A) Training dataset B) LR model C) LS-PLM model

From the figures above, it is clear that LS-PLM (MLR) model better fitted the training dataset. The model is aimed at industrial scale sparse data for example online shopping. The model is also used by Taobao therefore also suit the bookstore situation. Therefore it is suitable for our system.

The next improvement should be the offline customer delivery problem. We ought to solve the problem associated with take-out

service or drones. For instance, the mobile application '达达' offers errand services which allows customers to send riders deliver objects to a certain receiver. The offline bookstore could outsource the fast delivery service for offline customers through such apps. This method is not only practical but also bring more benefit. Outsourcing the service occurs low cost for the bookstore and the fees should be afforded by the customers meanwhile as an improvement on offline shopping services which increases customer retention rate. Another method is rather lack of feasibility. One reason is that drone delivery causes large cost of the device as well as the drone operator. Worsely, the legal problems may rise because the unstable situation of regulation on UAVs.

With respect to information security, we could learn from bank system. Firstly, the device which stores customers information or other classified information shall only be connected in Local Area Network (LAN). Therefore, information could not be leak by internet. To prevent theft during operation involving USB flash stick, we restrict a certain USB that could plug in the computer and requires application and recording. To enhance security, monitoring is advised to deploy facing right to the computer contains the important information. The method is indeed complicated but not redundant. The benefits from security will defeat the cost occurs during such method. For instance, better reputation of information security will increase customer loyalty.

To deal with concurrency, the first method is locking. When one store's device is operating on a certain dataset, the access of other bookstores' devices will be denied therefore interference is prevented.

It is worth considering adding another protocol concerning position of lock and unlock operation because unlock too soon may cause loss of total isolation and atomicity. When 2 transaction is waiting, Deadlock problems may occur. We set timeouts to solve where a limit of waiting time is introduced, if time limitation exceeded, the waiting will be over. The second method is timestamp method, which system will roll back to older transaction when conflict appears. This is conducted through the unique identifier created by the DBMS system when the transaction starts. Read or write will only proceeds when last update is confirmed to be an older transaction so the method avoids information inconsistency. Both methods are feasible and easy to implement by adding operation protocols.

Appendix:

1. Database System Development Lifecycle

1.1 Mission Objective

According to the bookstore's current situation, the database is mainly designed to fulfill the requirements of four groups of users: customers, online and offline bookstore managers, customer relationship manager and after-sale service manager. The detailed objectives are listed as below:

- To maintain (enter, update and delete) data on customers
- To maintain (enter, update and delete) data on membership
- To maintain (enter, update and delete) data on order
- To maintain (enter, update and delete) data on comment
- To maintain (enter, update and delete) data on after-sale service
- To maintain (enter, update and delete) data on staff
- To maintain (enter, update and delete) data on book
- To maintain (enter, update and delete) data on logistics
- To perform searches on customers
- To perform searches on membership
- To perform searches on order
- To perform searches on comment
- To perform searches on staff
- To perform searches on book

- To perform searches on book
- To perform searches on after-sale service
- To report on customers
- To report on membership
- To report on orders
- To report on comment
- To report on staff
- To report on book
- To report on after-sale service

1.1 System Definition

The database is designed for customers, managers and staffs. Thus, the system includes the information of customers, book, orders, logistics, managers and staffs and related activities. However, the supply and inventory of book is not included in the system. In addition, the advertisement is arranged outside of the system boundary. The system boundary is shown in the following diagram.

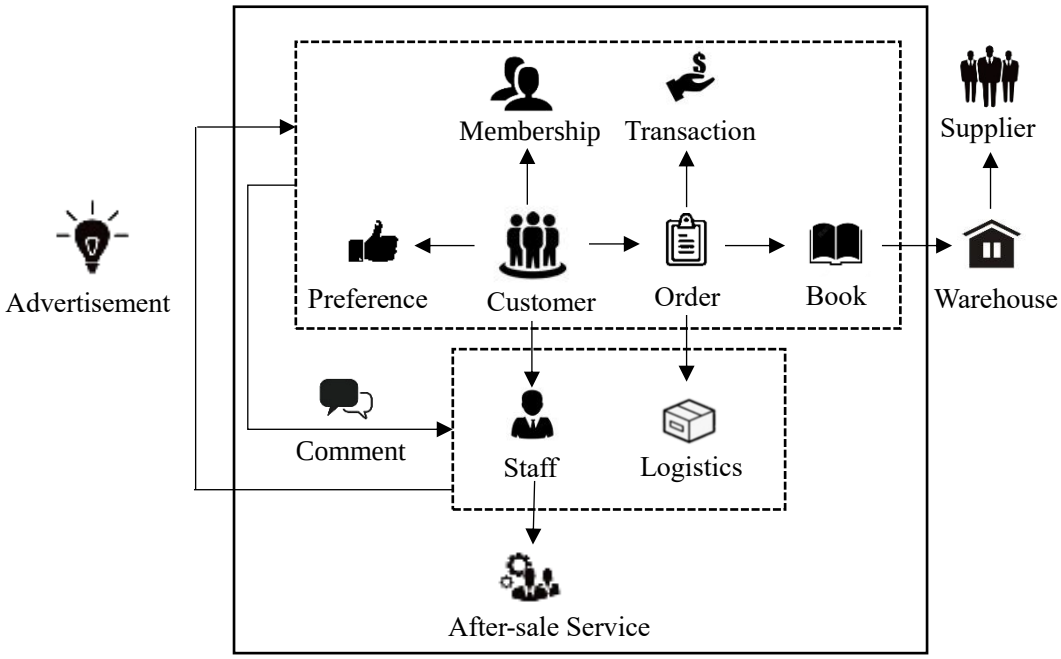


Figure 2. System Boundary

1.2 Requirements collection and analysis

Based on the specific requirements of each user, the use case diagram for customer user view, bookstore manager user view, customer relationship manager user view and after-sale service manager user view are shown in Figure 1.3.1, 1.3.2, 1.3.3, 1.3.4 and corresponding Table 1.3.1, 1.3.2, 1.3.3, 1.3.4.

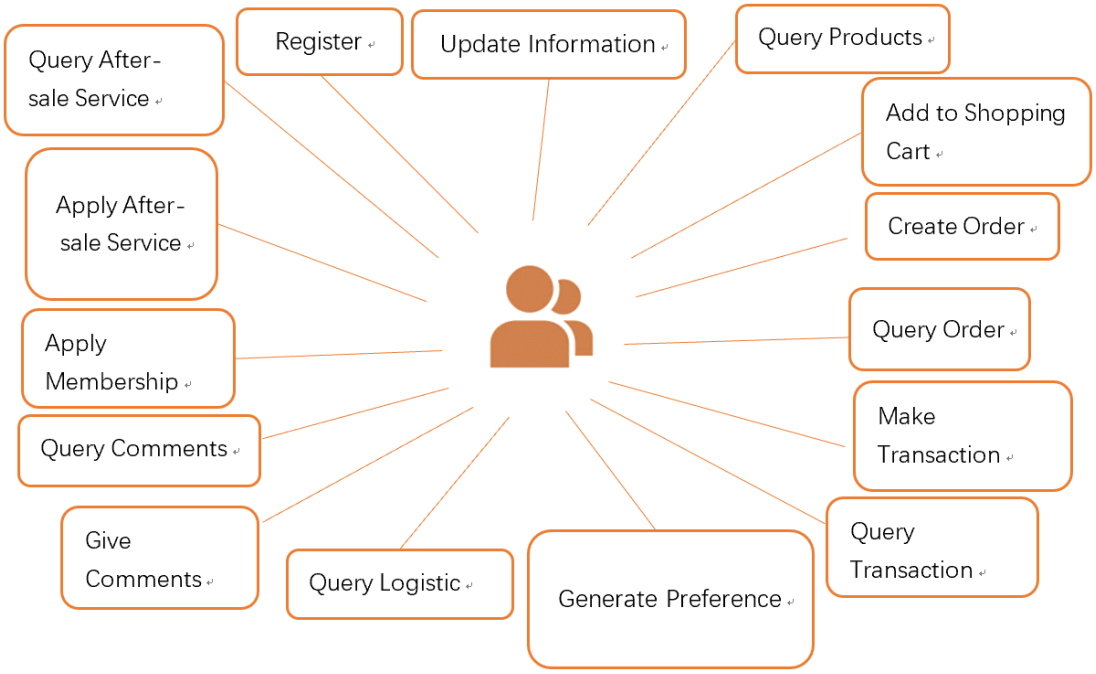


Figure 1.3.1 Use Case Diagram for Customer User View

1. Register	A customer is required to register before making an order, he or she will need to fill in their personal information, eg. Name. Finishing that, they will obtain a unique CustomerID.
2. Update Information	A customer can update its detailed personal information.
3. Query Products	A customer can view the details of a book and query staff for information.
4. Add to Shopping Cart	A customer can select the books they would like to buy and add them into shopping cart.
5. Create Order	A customer can create an order directly when viewing books or through shopping cart. An OrderID is created once a transaction is made.

6. Query Order	A customer can view his past orders.
7. Make Transaction	A TransactionID is made once a purchase is
8. Query Transaction	A customer can view his transaction.
9. Generate Preference	Once a transaction is finished, a preference of specific category of books is generated. Consumers will receive recommendation of books from the same category.
10. Query LogisticID	A customer can view his or her LogisticID of orders.
11. Give Comments	A customer can make comments about products or service. All comments will be labled with CommentID.
12. Query Comments	A customer can view his past comments.
13. Apply Membership	A customer will automatically be a member once his or her expenditure has accumulated to 200 RMB.
14. Apply After-sale Service	A consumer can apply for after-sale service when there is non-artificial quality problems happened in warranty period. All applications will be identified with After-sale ServiceID. After-sale service includes barter and refund.
15. Query After-sale Service	A customer can view his past after-sale service application.

Table 1.3.1 Use Case Description for Customer User View

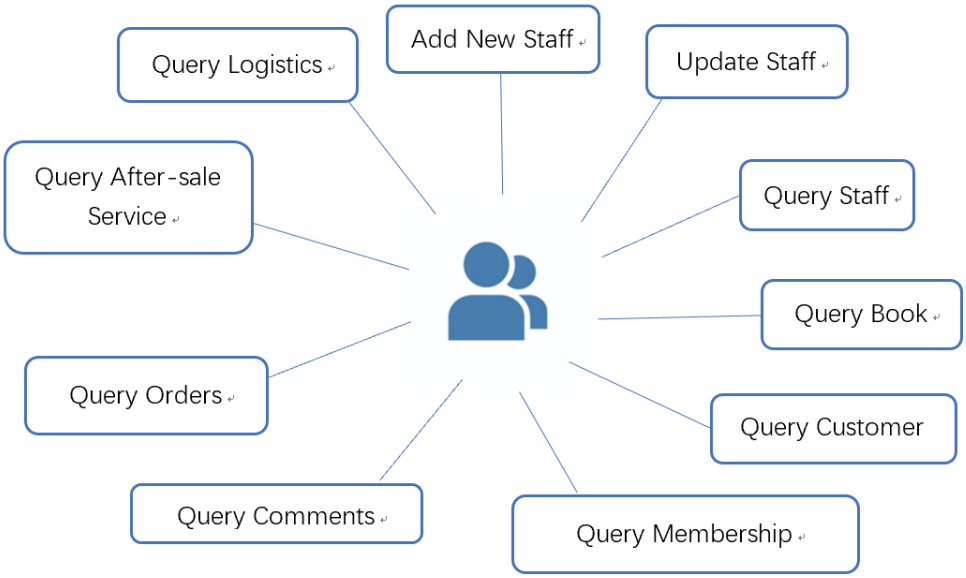


Figure 1.3.2 Use Case Diagram for Bookstore Manager User View

1. Add new Staff	Bookstore manager can add new staff to the database. Each staff is indentifies with a unique StaffID.
2. Update Staff	Bookstore manager can update staff information according to situation.
3. Query Staff	Bookstore manager can view staff's information.
4. Query book	Bookstore manager can view detailed information of books.
5. Query Customer	Bookstore manager can view customer's information.
6. Query Membership	Bookstore manager can view customer's membership level.
7. Query Comments	Bookstore manager can view comments about books and their service to make adjustments.
8. Query Orders	Bookstore manager can view details of orders.
9. Query After-sale Service	Bookstore manager can contact with after-sale manager and view details of an after-sale service. The service includes returning, exchanging and
10. Query Logistics	Bookstore manager can view logistics of orders.

Table 1.3.2 Use Case Diagram Description for Bookstore Manager User View

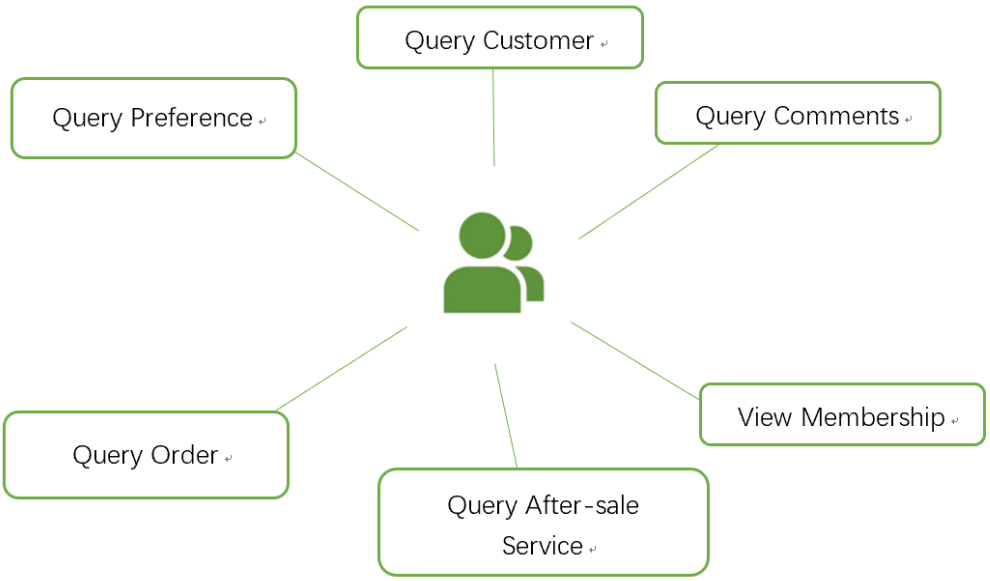


Figure 3.3 Use Case Diagram for Customer Relationship Manager User View

1. Query Customer	Customer relationship manager can view customers' information to check their preferences.
2. Query Comments	Customer relationship manager can view customer's comments.
3. View Membership	Customer relationship manager can view customer's membership level.
4. Query After-sale Service	Customer relationship manager can view the reasons and customers' requirements of after-sale service to improve service quality.
5. Query Order	Cutomer relationship manager can view order details.
6. Query Preference	Customer relationship manager can view consumer preference and the books that recommended to customers based on their preference.

Table 1.3.3 Use Case Diagram Description for Customer Relationship Manager User View

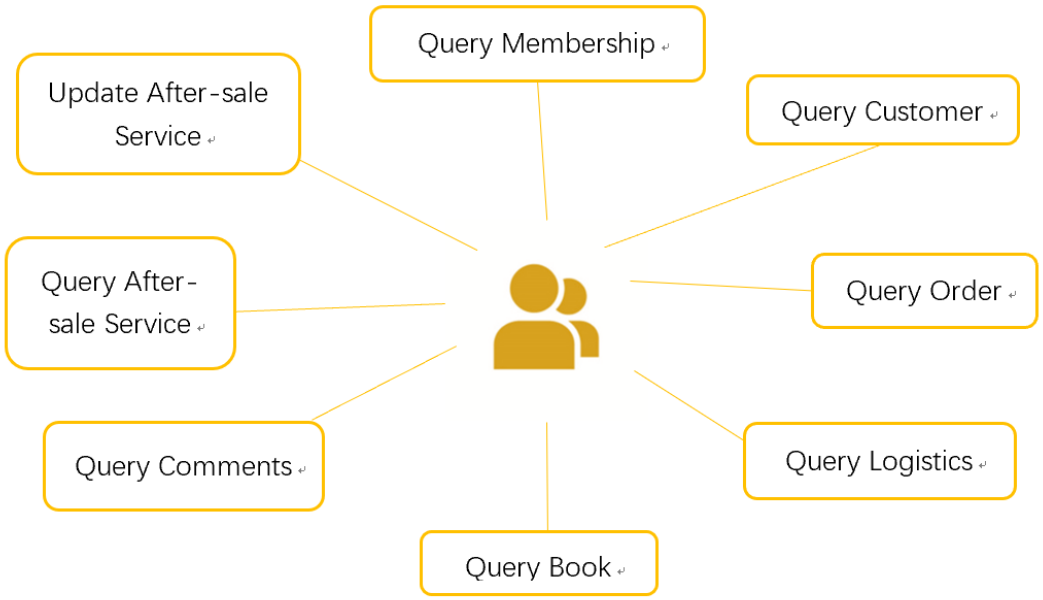


Figure 1.3.4 Use Case Diagram for After-sale Manager User View

1. Query Customer	After-sale manager can check the details of customer information.
2. Query Order	After-sale manager can check the details of orders.
3. Query Logistics	After-sale manager can view the details of logistics.
4. Query Book	After-sale manager can check the details of the book sold to specific cutomer.
5. Query Comments	After-sale manager can view the comments to improve their products and service.
6. Query After-sale Service	After-sale manager can view customer's after-sale service requirements.
7. Update After-sale Service	After-sale manager can update after-sale service applications.
8. Query Membership	After-sale manager can view customer's membership level.

Table 1.3.4 Use Case Diagram Description for After-sale Manager User View

2. Meeting Minutes

<table>
<tr><th colspan="4">Meeting Minute 1</th></tr>
<tr><td>Date</td><td>4/1/19</td><td>Time</td><td>13:00-15:00</td></tr>
<tr><td>Location</td><td>Canteen 4</td><td>Recorder</td><td>Siying Xiang</td></tr>
<tr><td>Presence</td><td colspan="3">Siying Xiang, Qirui Xiang, Xin Wang, Yuanqin Sheng</td></tr>
<tr><td>Absence (Reason)</td><td colspan="3">None</td></tr>
<tr><td colspan="4">Meeting Report</td></tr>
<tr><td colspan="4">1. Outline the mission of the database
2. Discuss about the requirements of various database user
3. Define the boundary of this database’s function
4. Sort out the customers’ online and offline shopping process
5. Find out entities</td></tr>
<tr><td colspan="4">Results/Reminder</td></tr>
<tr><td>What</td><td>Who</td><td>Deadline</td><td>Remarks</td></tr>
<tr><td>List attributes of the entities</td><td>All</td><td>4.8</td><td></td></tr>
<tr><td>Draw rough E-R Diagram</td><td>All</td><td>4.8</td><td></td></tr>
</table>

Meeting Minute 2			
Date	4/15/19	Time	15:00-17:00
Location	PB lobby	Recorder	Qirui Xiang
Presence	Siying Xiang, Qirui Xiang, Xin Wang, Yuanqin Sheng		
Absence (Reason)	None		

Meeting Report

1. Rediscuss the ER diagram
2. Find the weakness and problem of the current ER diagram
3. Decide the new ER diagram
4. Discuss related SQL and business intelligence

Results/Reminder

What	Who	Deadline	Remarks
Modify the attributes and entities of ER	All	4.20	
Use Access to create the ER table	All	4.20	

Meeting Minute 3			
Date	4/22/19	Time	13:00-15:00
Location	PB lobby	Recorder	XIN WANG
Presence	Siying Xiang, Qirui Xiang, Yuanqin Sheng, Xin Wang		
Absence (Reasons)	None		

Meeting Report

1. Discuss the methods applied in business intelligence
2. Discuss the improvements of the database
3. Decide the SQL queries

Results/Reminder

What	Who	Deadline	Remarks
Use regression analysis and data visualization	All	4.25	
Write SQL queries	All	4.25	

Meeting Minute 4			
Date	4/25/19	Time	15:00-18:00
Location	PB lobby	Recorder	Yuanqin Sheng
Presence	Siying Xiang, Qirui Xiang, Yuanqin Sheng, Xin Wang		
Absence (Reasons)	None		

Meeting Report

1. Discuss the advantages and disadvantages of the system
2. Discuss the improvements of the limitations
3. Discuss the SQL queries

Results/Reminder

What	Who	Deadline	Remarks
Write SQLs	All	4.28	
Write limitations and improvements	All	4.28	

3. Reference

Kun,G., Xiaoqiang,Z., Han,L., Kai.L., Zhe,W. (2017) *Learning Piece-wise Linear Models from Large Scale Data for Ad Click Prediction*. Cornell University.