ISYS224 – ASSIGNMENT ONE

Database Design & Implementation

(PowerDesigner & MySQL)

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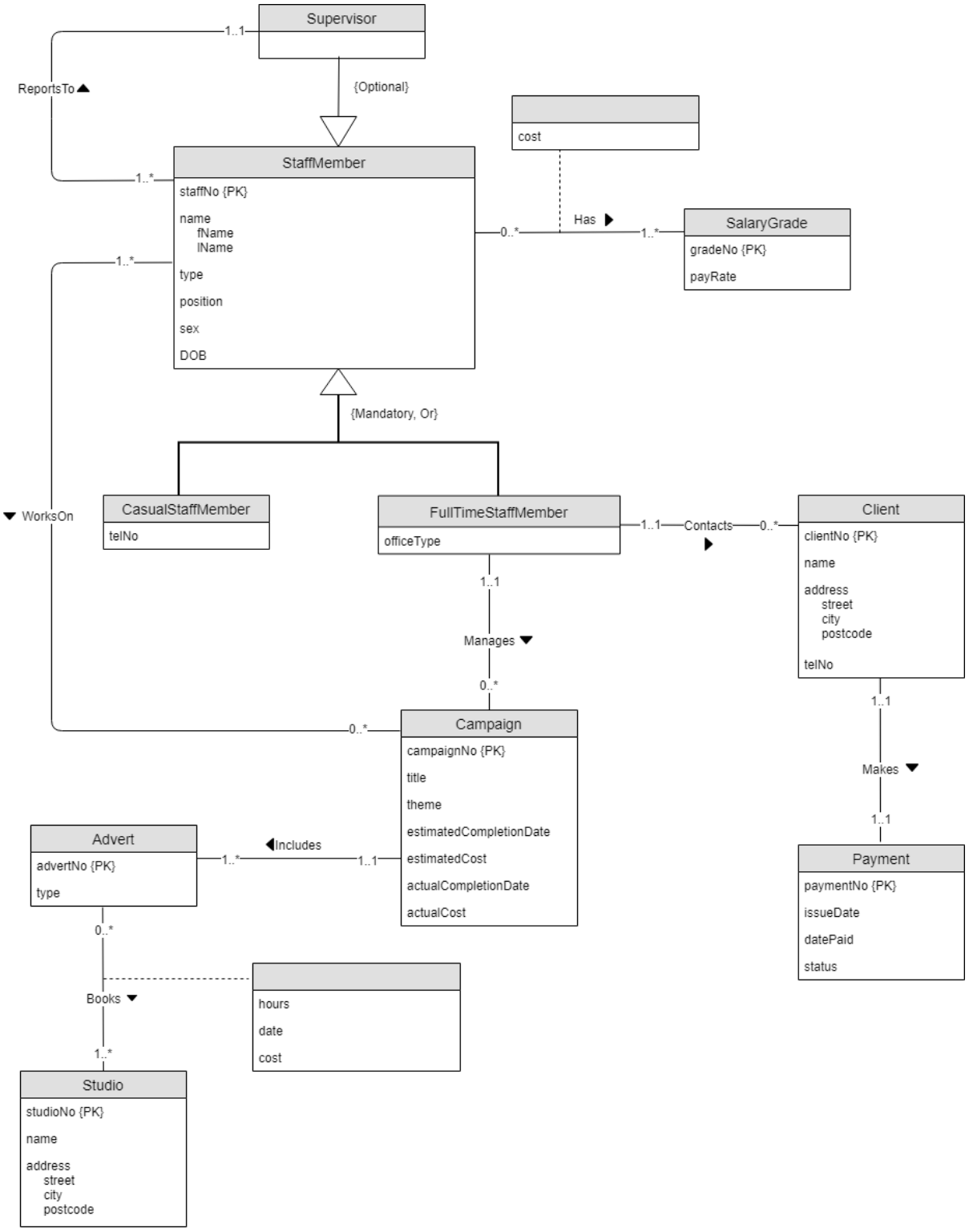
Task 1: Conceptual Data Model

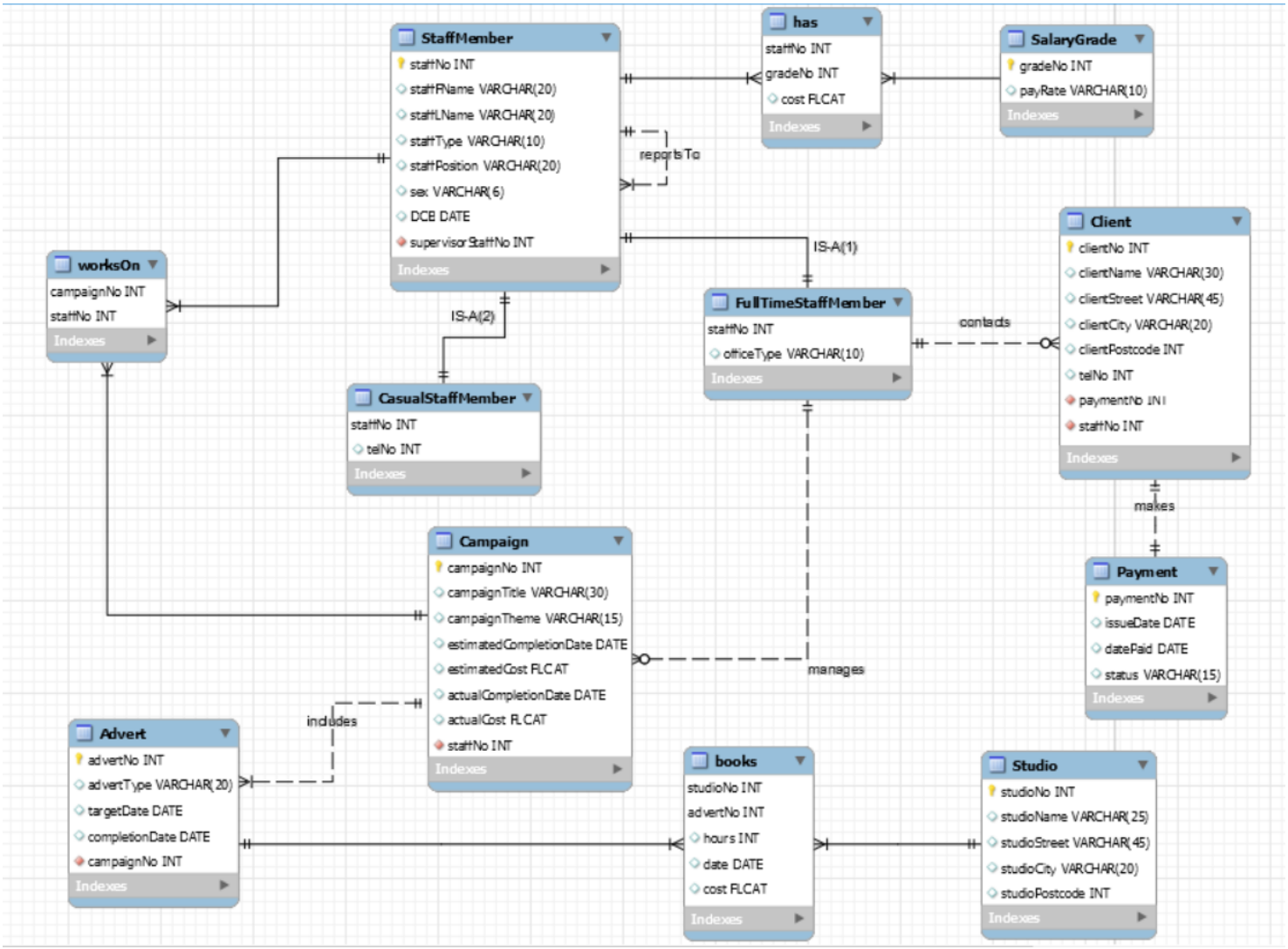


- There is generalisation/specialisation between StaffMember and Supervisor because a Supervisor can be a StaffMember and there is a relationship between them as a StaffMember reports to a Supervisor.
- There is generalisation/specialisation between StaffMember and CasualStaffMember and FullTimeStaffMember because a StaffMember has to be a CasualStaffMember or a FullTimeStaffMember, the subclasses have their own attributes and FullTimeStaffMember only has a relationship with Campaign and a relationship with Client.
- There are attributes on the relationship between Advert and Studio because a booking of an advert at a studio includes the number of hours, date and cost of the booking.
- There is an attribute on the relationship between StaffMember and SalaryGrade because the cost of a SalaryGrade is dependent on the circumstances when a StaffMember held the SalaryGrade.

ASSUMPTIONS

- The FullTimeStaffMember entity has an attribute called officeType (Small/Medium/Large) because a FullTimeStaffMember has a permanent office in the agency.
- Every StaffMember reports to a single Supervisor within the company (no managing director in my database).
- The cost of a SalaryGrade is dependent on the circumstances when a StaffMember held the SalaryGrade (for example, a pay rise during a campaign, see Task 4). The base pay rates of each grade are fixed.
- The hourly rate for studio bookings is different for each Studio.
- There has to be at least one (1) StaffMember working on a Campaign at any point in time.

Task 2: Logical Data Model



NOTE: The attributes which act as a primary and a foreign key for a relation are those which don't have a symbol next to them. I am mentioning this because MySQL failed to put a symbol next to them.

I translated the conceptual data model into the logical data model by:

- Adding foreign keys
- Creating associative entities for many-to-many relationships in the conceptual data model
- Forming one-to-one relationships between the subclasses and the superclass of a generalisation/specialisation
- Dividing composite attributes into separate unique attributes in the logical data model

Task 3: Logical Data Model

Relations in the Logical Data Model

1) StaffMember (staffNo, staffFName, staffLName, staffType, staffPosition, sex, DOB, supervisorStaffNo)

Nontrivial FDs:

- staffNo -> staffFName, staffLName, staffType, staffPosition, sex, DOB, supervisorStaffNo

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

2) FullTimeStaffMember (staffNo, officeType)

Nontrivial FDs:

- staffNo -> officeType

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

3) CasualStaffMember (staffNo, telNo)

Nontrivial FDs:

- staffNo -> telNo

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

4) SalaryGrade (gradeNo, payRate)

Nontrivial FDs:

- gradeNo -> payRate

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

5) has (staffNo, gradeNo, cost)

Nontrivial FDs:

- staffNo, gradeNo -> cost

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

6) Campaign (campaignNo, campaignTitle, campaignTheme, estimatedCompletionDate, estimatedCost, actualCompletionDate, actualCost, staffNo)

Nontrivial FDs:

- campaignNo -> campaignTitle, campaignTheme, estimatedCompletionDate, estimatedCost, actualCompletionDate, actualCost, staffNo

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

7) worksOn (campaignNo, staffNo)

This relation has no nontrivial functional dependencies.

8) Advert (advertNo, advertType, targetDate, completionDate, campaignNo)

Nontrivial FDs:

- advertNo -> advertType, targetDate, completionDate, campaignNo

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

9) Studio (studioNo, studioName, studioStreet, studioCity, studioPostcode)

Nontrivial FDs:

- studioNo -> studioName, studioStreet, studioCity, studioPostcode

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

10) books (studioNo, advertNo, hours, date, cost)

Nontrivial FDs:

- studioNo, advertNo -> hours, date, cost

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

11) Payment (paymentNo, issueDate, datePaid, status)

Nontrivial FDs:

- paymentNo -> issueDate, datePaid, status

Normal Form:

This relation is in **BCNF** as there are no repeating groups (1NF), no partial dependencies (2NF), no transitive dependencies (3NF) and all determinants are candidate keys.

12) Client (clientNo, clientName, clientStreet, clientCity, clientPostcode, telNo, paymentNo, staffNo)

Nontrivial FDs:

- clientNo -> clientName, clientStreet, clientCity, clientPostcode, telNo, paymentNo, staffNo

- paymentNo -> staffNo (assuming that each client makes a single payment to a certain full-time staff member)

Normal Form:

This relation is in **2NF** as there are no partial dependencies but there is a transitive dependency.

If for example clientNo -> clientName was also a nontrivial FD for the Client relation, then the relation would be in 1NF as there are no repeating groups but there is a partial dependency.

Task 4: DDL

1) staffmember TABLE

staffNo	staffFName	staffLName	staffType	staffPosition	sex	DOB	supervisorStaffNo
1001	Ezio	Auditore	Full Time	Account Manager	Male	1978-05-09	1003
1002	Desmond	Miles	Full Time	Accountant	Male	1980-03-06	1001
1003	Lucy	Stillman	Full Time	Account Manager	Female	1979-01-01	1001
1004	Shaun	Hastings	Casual	Actor	Male	1986-09-04	1003
1005	Rebecca	Crane	Full Time	Technical Personnel	Female	1976-02-03	1001
1006	Rodrigo	Borgia	Casual	Graphic Designer	Male	1982-03-03	1003
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

2) fulltimestaffmember TABLE

staffNo	officeType
1001	Large
1002	Small
1003	Large
1005	Medium
NULL	NULL

3) casualstaffmember TABLE

staffNo	telNo
1004	12340001
1006	12340002
NULL	NULL

4) salarygrade TABLE

gradeNo	payRate
1	Hourly
2	Hourly
3	Annual
4	Annual
5	Annual
NULL	NULL

5) has TABLE

staffNo	gradeNo	cost
1001	3	1000
1002	4	750
1002	5	500
1003	3	1000
1004	1	15
1004	2	10
1005	5	450
1006	2	10
NULL	NULL	NULL

6) campaign TABLE

campaignNo	campaignTitle	campaignTheme	estimatedCompletionDate	estimatedCost	actualCompletionDate	actualCost	staffNo
2001	Among Thieves	Sports	2019-05-12	1000	2019-06-24	900	1001
2002	Golden Abyss	Music	2018-03-06	1200	2018-03-15	1300	1003
2003	Drakes Deception	Video Games	2014-10-10	700	2014-07-10	900	1003
2004	Drakes Fortune	Video Games	2017-07-19	900	2017-09-21	1100	1003
2005	The Lost Legacy	Music	2016-03-27	1500	2016-04-26	1300	1001
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

7) workson TABLE

campaignNo	staffNo
2001	1001
2005	1001
2001	1002
2004	1002
2002	1003
2003	1003
2004	1003
2002	1004
2001	1005
2004	1005
2003	1006
NULL	NULL

8) advert TABLE

advertNo	advertType	targetDate	completionDate	campaignNo
3001	Website	2019-05-06	2019-06-12	2001
3002	TV	2014-07-01	2014-07-03	2003
3003	Newspaper	2018-03-02	2018-03-11	2002
3004	Magazine	2017-07-30	2017-08-11	2004
3005	TV	2014-06-27	2014-06-29	2003
3006	Magazine	2016-04-21	2016-04-03	2005
3007	TV	2014-06-22	2014-06-24	2003
NULL	NULL	NULL	NULL	NULL

9) studio TABLE

studioNo	studioName	studioStreet	studioCity	studioPostcode
4001	Crash	2 Cove St	Mystery	12345
4002	Coco	68 Roos Ave	Tubes	12346
4003	Dingodile	54 Cortex Rd	Castle	12347
4004	Spyro	15 Android St	Alley	12348
4005	Hunter	4 Electron Ave	Ruins	12349
NULL	NULL	NULL	NULL	NULL

10) books TABLE

studioNo	advertNo	hours	date	cost
4001	3006	5	2016-03-24	200
4001	3007	2	2014-05-23	100
4002	3004	5	2017-09-06	125
4003	3001	3	2019-05-27	150
4003	3002	4	2014-06-24	100
4004	3003	7	2018-03-05	175
4005	3005	3	2014-06-18	75
NULL	NULL	NULL	NULL	NULL

11) payment TABLE

paymentNo	issueDate	datePaid	status
5001	2019-06-24	2019-07-01	Paid
5002	2018-03-15	2018-03-22	Paid
5003	2014-07-10	2014-07-17	Paid
5004	2017-09-21	2017-09-28	Paid
5005	2016-04-26	2016-05-03	Paid
NULL	NULL	NULL	NULL

12) client TABLE

clientNo	clientName	clientStreet	clientCity	clientPostcode	telNo	paymentNo	staffNo
6001	Tiny Tiger	5 Jungle St	Boogie	12665	12340003	5001	1003
6002	Gnasty Gnorc	12 Island Ave	Inferno	12666	12340004	5002	1003
6003	Nash	17 Barin St	Caves	12667	12340005	5003	1001
6004	Pinstripe	23 Tour Rd	Twilight	12668	12340006	5004	1001
6005	Zem	1 Tiger St	Temple	12669	12340007	5005	1003
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

NOTE: FullTimeStaffMember and CasualStaffMember have less than 5 records in each of their respective tables because there are four (4) full-time staff members and two (2) casual staff members in the StaffMember table which itself satisfies the requirement of a minimum of 5 records per table. Having a minimum of five (5) full-time staff members and five (5) casual staff members in my database would have made my database overcomplicated to work with. My tables satisfy the requirement that the result of each SQL query for Task 5 will return at least one (1) record.

Task 5: DML

Q1)

```
365  /* Q1 */
366  SELECT campaignTitle, campaignTheme
367  FROM campaign
368  WHERE actualCost <
369  (SELECT AVG(estimatedCost)
370  FROM campaign);
```

Result Grid | Filter Rows: | Export:

campaignTitle	campaignTheme
Among Thieves	Sports
Drakes Deception	Video Games

Q2)

```
373  /* Q2 */
374  SELECT campaignTitle, COUNT(advertNo) 'Number of Advertisements', completionDate, targetDate
375  FROM campaign c, advert a
376  WHERE c.campaignNo = a.campaignNo
377  GROUP BY campaignTitle
378  HAVING completionDate < targetDate;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

campaignTitle	Number of Advertisements	completionDate	targetDate
The Lost Legacy	1	2016-04-03	2016-04-21

Q3)

```
381  /* Q3 */
382  SELECT DISTINCT staffFName, staffLName
383  FROM staffmember s, fulltimestaffmember f, campaign c
384  WHERE s.staffNo = f.staffNo
385  AND f.staffNo = c.staffNo
386  AND s.supervisorStaffNo <> c.staffNo;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

staffFName	staffLName
Ezio	Auditore
Lucy	Stillman

Q4)

```
383  /* Q4 */
384  SELECT campaignTitle, count(DISTINCT s.staffNo) 'Number of Staff Members'
385  FROM campaign c, workson w, staffmember s, has h
386  WHERE c.campaignNo = w.campaignNo
387  AND s.staffNo = w.staffNo
388  AND s.staffNo = h.staffNo
389  AND gradeNo > 2
390  GROUP BY campaignTitle
391  HAVING count(DISTINCT s.staffNo) > 2;
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

campaignTitle	Number of Staff Members
Among Thieves	3
Drakes Fortune	3

Q5)

```
393  /* Q5 */
394  SELECT DISTINCT f.staffNo, staffFName, staffLName, staffType
395  FROM staffmember s, fulltimestaffmember f
396  WHERE s.staffno = f.staffno
397  AND f.staffNo NOT IN (SELECT staffNo FROM campaign);
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

staffNo	staffFName	staffLName	staffType
1002	Desmond	Miles	Full Time
1005	Rebecca	Crane	Full Time