FIT2094-3171 Introduction to Databases

Semester 2, 2019

Assignment A1b - Database Design - Loyalty App System (LA) Team Assignment.

Assignment weighting 20%

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1. Preambles

1. ⚠ **Warning - pay special attention to the items marked in red and/or with a ⚠ symbol. Failure to adhere to these will result in marks deductions.**
2. ⚠ **Any attempt to cheat in this unit will be referred to the Faculty for disciplinary action. As a reminder, Faculty and unit management are aware of this and frequently detect and report cases of cheating every year.**

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2. Background

This task continues the work you have started in A1a by refining/extending the model you developed and implementing it as a set of tables under your Monash Oracle database account.

> ⚠**IMPORTANT NOTE BEFORE STARTING.**
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> Assignment A1b's brief must be read in **conjunction** with the A1a brief - i.e. your final model must encompass both sets of requirements.
>
> In this business case simulation, **the Client ("LoyaltyApp")** has considered all the Monash expert opinions (via the "Client Forum" on Moodle), and have made **several extra directives/requirements set forth in this document** which may **override** prior design 'draft' decisions. **Therefore, there are some extra requirements stated below in S3.2, which clarify / disambiguate the questions posted on the Client Forum.**

You may modify your A1a conceptual model in any manner you wish as you work through A1b, provided your final model meets both sets of requirements.

3. Further Design Choices

3.1. Redemptions, COP, and Gifts

Further discussions with the LoyaltyApp have revealed that customers who have sufficient points can conduct Redemption transactions to gain Gifts. (These redemptions are quite rewarding, which is why customers are encouraged to use LoyaltyApp! 😀). These Redemptions are done online, and does not involve any staff or stores etc. The information required to be stored in the LoyaltyApp backend can be found in Section 3.3.

These Gift types include e.g. "Free 14-day trip to Bali by Flight Centre Australia - 80000 points", "Free toaster at Hirsch's Johannesburg for 6000 points", "Free coffee at Starbucks Malaysia for 500 points" etc. Once a Redemption takes place, the customer may be subject to a 'cooling-off period' (COP) which stops them from gaining any points and pauses their VIP statuses (if any) for a set amount of time, to keep the program fair for other customers. The COPs range from a period of 0 days (for small Gifts like "Free coffee") to 100 days (for large Gifts like "Free 14-day trip").

LoyaltyApp needs to have recorded, for each redemption: what Gift type is redeemed; the number of points spent (and the new balance); if it leads to a COP - and for those that do, the number of days for which takes effect. When a COP is granted, its start date is set to the date of the Redemption. which triggered the status. After ending the COP, the customer needs to fill up a survey of their experience before restoring their regular membership status - this has to be logged.

3.2. Business Rules and Choices

There are several business rules which LoyaltyApp Management needs to clarify, based on database designers' queries.

1. A payment card has a PCCN; but in the rare event that there are 'collisions' between PCCNs, LoyaltyApp requires the combination of PCCN and suitable bank information as a compound key.
2. Due to privacy concerns, no customers can share a payment card -- in other words, for a particular card, only ONE customer can use it.
3. Recognising the business practices of similar modern web businesses (e.g. Didi, Uber, AirTasker, AirBnB), LoyaltyApp has allowed the mobile phone number to change. Hence, a surrogate key may be introduced **ONLY in the logical model** to uniquely identify a customer. LoyaltyApp wants it to be standardised in the format CUST_###### - e.g. the first Customer is CUST_000001 etc.
4. **None** of the following will be supported: split payments, online stores without a retail outlet, cash transactions.

⚠️**IMPORTANT NOTE ON SCOPE EXPANSION**

LoyaltyApp has also recognised that some database expert teams might only have one team member, whereas some other database teams might have two members. Therefore they have consulted their Board of Directors and shareholders for the following business decisions.

👤**FOR TEAMS OF ONE: To keep the project on track, they have refined the scope as follows.**

Due to insufficient scope, LoyaltyApp does not support staff working at more than one store. Therefore, no history needs to be kept for staff work records; with the proviso that staff can freely switch between stores but only after they finish their contract with a current store (i.e. no concurrent work at more than one store). A1a's spec still holds, i.e. only the staff needs to be logged in a Purchase.

In addition, for Rewards, the company directors assume that all stores must uniformly have a given reward if it applies to their business. Say, for a Burger Reward - all stores selling burgers must have the reward.

👥 **FOR TEAMS OF MORE THAN ONE: LoyaltyApp is impressed with the speed and quality of your design!**

After meeting their Board of Directors, they have now decided to allow staff to work at more than one store (e.g. to support casual staff working at multiple venues in a single day). However, to prevent conflict-of-interest, each allocation (or shift) at each store must be logged, including the time a staff member started the shift, and the time they ended the shift. This effectively creates a 'history' for auditing purposes. For transparency and to prevent fraud, each staff member's associated shift needs to be logged for each Purchase.

Their Board of Directors also decided that for each Store, they can independently decide if they want to have a given reward. Say for a Fuel Reward, not all petrol stations (servos) might want to implement it. Therefore, there needs to be a mechanism to keep track of which stores support which rewards.

3.3. Normalisation based on Internal Business Documents

LoyaltyApp Management have also provided three of their internal documents, depicted below, which they make use of showing some of the data they wish to record:

A sample payment card report:
- The credit rating is derived from the number of transactions so far:
  A (200+); B (100-199); C (50-99); D (< 50).

- Features for verification: this indicates physical markers on the card that help staff quickly verify the correct card is used. It can be a combination of all/any of the 4 features shown on the form.
- Note that LoyaltyApp has indicated that it needs flexibility in the design to be able to add new, and remove current 'payment card types' and 'features for verification' as circumstances change.
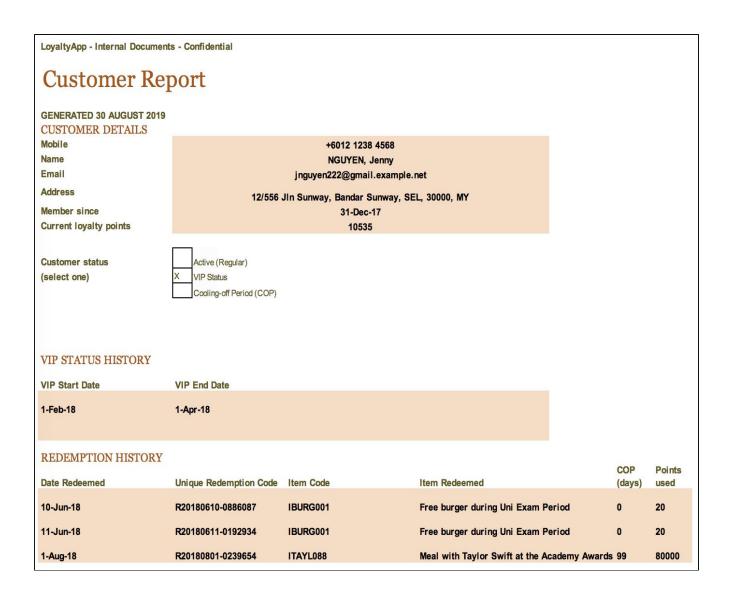

LoyaltyApp - Internal Documents - Confidential

Payment Card Report

GENERATED 30 AUGUST 2019

CARD DETAILS

PCCN	5555669999
Month of Expiry (MM)	09
Year of Expiry (YYYY)	2028
Brand	Frequent Flyer Platinum Mastercard
Transactions to date	96
Credit rating based on transactions	C

Signature verification:
(select one)

X	Back of card
	No signature

Features for verification:
(select any/all which apply)

X	Physical card
X	Magnetic stripe visible
X	CVV visible
X	Chip visible

Type of payment card:
(select one)

X	Credit Card
	Debit Card
	Virtual NFC Card
	Physical Gift Card
	Virtual Gift Card

Bank code: AU-345677889

BANK DETAILS

Name:	Commonwealth Bank of Australia
Country (ISO 3166 2-letter code)	AU
Moody's Bank Rating:	Aa3
Headquarters:	Darling Harbour, Sydney, Australia

Two sample customer reports:
- Note that one customer has more details than the other.
- Do consider both reports in your normalisation. See Section 5 for full explanation.

Customer Report

GENERATED 30 AUGUST 2019

CUSTOMER DETAILS

Mobile	+614 12 345 678
Name	GONZALES, Billy
Email	b.gonzales@facebook.example.com
Address	123 Fake St, Shepparton, VIC, 3630, AU
Member since	1-Jan-19
Current loyalty points	886

Customer status
(select one)

X	Active (Regular)
	VIP Status
	Cooling-off Period (COP)

VIP STATUS HISTORY

NONE FOUND

REDEMPTION HISTORY

NONE FOUND

(continued next page)

Customer Report

GENERATED 30 AUGUST 2019

CUSTOMER DETAILS

Mobile	+6012 1238 4568
Name	NGUYEN, Jenny
Email	jnguyen222@gmail.example.net
Address	12/556 Jln Sunway, Bandar Sunway, SEL, 30000, MY
Member since	31-Dec-17
Current loyalty points	10535

Customer status
(select one)

- [ ] Active (Regular)
- [X] VIP Status
- [ ] Cooling-off Period (COP)

VIP STATUS HISTORY

VIP Start Date	VIP End Date
1-Feb-18	1-Apr-18

REDEMPTION HISTORY

Date Redeemed	Unique Redemption Code	Item Code	Item Redeemed	COP (days)	Points used
10-Jun-18	R20180610-0886087	IBURG001	Free burger during Uni Exam Period	0	20
11-Jun-18	R20180611-0192934	IBURG001	Free burger during Uni Exam Period	0	20
1-Aug-18	R20180801-0239654	ITAYL088	Meal with Taylor Swift at the Academy Awards	99	80000

A customer Redemption COP report.
- This should be fairly self-explanatory.

Cooling-off Period (COP) Report

GENERATED 30 AUGUST 2019

CUSTOMER DETAILS

Mobile	+6012 1238 4568
Name	NGUYEN, Jenny

COOLING-OFF PERIOD HISTORY

Date Started	Unique Redemption Code	Date Ending	Notes	Survey completed
1-Aug-18	R20180801-0239654	11-Aug-18	Delivered by email -- customer says thanks, had selfies with Taylor and photo op with many other stars.	9-Aug-18

4. Moodle Forum (to simulate an industry client)

REMEMBER you must keep up to date with the Moodle A1b Client Forum where further clarifications may be posted (this forum is to be treated as your client). Please be careful to ensure you do not post anything which includes your reasoning, logic or any part of your work to this forum, doing so violates Monash plagiarism/collusion rules.

You are free to make assumptions if needed however they must align with the details here and in the assignment forums and must be clearly documented (see the required submission files).

5. Tasks

ENSURE your **name and ID as well as your team number are shown on every page of any document you submit**. If a document is a multipage document (such as the normalisation), please also make sure you include page numbers on every page.

⚠ **INSPECTIONS BY TUTORING/TA STAFF IN LABS/TUTES**

As you work on this assignment task, your team will have to show the progress of the assignment *TO THE TEACHING STAFF IN THE LAB/TUTE AT LEAST ONCE*.

Any submission without this will incur a grade penalty of 10 marks (a 10 mark deduction).

Task to complete:

1. **TASK 1:**

    Based on your A1a conceptual model and feedback from your tutor, using Lucid Chart, **prepare FULL conceptual model** using Crows-Foot notation for LoyaltyApp System. For this **FULL** conceptual model, you should include:

    - Identifiers (key) for each entity
    - All required attributes
    - All relationships. Participation and Connectivity for all relationships must be shown on the diagram; as well as clear labels.

    Surrogate key must not be added and your model should follow ERD notation standard used in this unit.

2. **TASK 2:**
    Perform **normalisation to 3NF** for the data depicted in the sample internal

documents/reports. Note that only one normalisation is required for the customer report, you have been provided with two samples so you can appreciate some of the variety which occurs.

The approach you are required to use is the same approach as shown in the normalisation lecture and tutes/labs in the unit. The normalisation must begin by representing the supplied documents as a single UNF form.

During normalisation, you must:

- **Not** add surrogate keys to the normalisation.
- You **must** include all attributes (you must **not remove** any attribute as derivable)
- Clearly show UNF, 1NF, 2NF and 3NF.
- Clearly identify the Primary Key in all relations.
- Clearly identify the partial and transitive dependencies (if they exist) in all 1NF relations. You may use a dependency diagram or alternative notation (see the normalisation tutorial sample solution for a possible alternative representation).
- If required, carry out attribute synthesis.

The attribute names used in your normalisation and those on your subsequent logical model must be consistent i.e. the same name used on each for the same property.

3. **TASK 3:**
   Based on your A1a conceptual model, your reading of this document (A1b) - including the correct 'SCOPE EXPANSION' in S3.2 - and the normalisations you carried out in TASK 1 above, **prepare a logical level design** for the LoyaltyApp database.

   - The logical model must be drawn using the Oracle Data Modeler. The information engineering or Crow's foot notation must be used in drawing the model. Your logical model must **not** show datatypes.
   - All entities depicted must be in 3NF
   - All attributes must be commented *in the database* (ie. the comments must be part of the table structure, not simply comments in the schema file).
   - Check clauses/look up tables must be applied to attributes where appropriate.
   - You **MUST** include the legend as part of your model.
   - Reminder: Note that you must clearly show your development history with your tutor/lab teacher in class as you work on your model.

4. **TASK 4:**
   Generate the schema for the database in Oracle Data Modeler and use the schema to create the database in your Oracle account. The *only* edit you are permitted to carry out to the generated schema file is to add header comment/s containing your details (student name/id) and the commands to spool/echo your run of the script.

   - Capture the output of the schema statements using the spool command.
   - Ensure your script includes drop table statements at the start of the script.

      ○ Name the schema file as **la_schema.sql.**

6. Submission Requirements

Assignment A1B:

⚠**Due: Week 9, Friday 27 September 2019, 11:55pm (at your campus's timezone).**

The following files are to be submitted by only **ONE TEAM MEMBER** and **must exist, along with the source documents from which they were generated:**

1. A pdf document showing containing full conceptual model. Name it **la_conceptual_full.pdf**. You are advised to refer to A1a on how to export pdfs from LucidChart.

2. A pdf document showing your full normalisation of the sample internal forms/documents showing all normal forms (UNF, 1NF, 2NF and 3NF). Name the file **la_normalisation.pdf**

3. A single page pdf file containing the final logical Model you created in Oracle Data Modeller. Name the file **la_logical.pdf.** This pdf must be created via *File - Data Modeler - Print Diagram - To PDF File* from within SQL Developer, do not use screen capture.

4. A zip file containing your Oracle data modeler project (in zipping these files be sure you include the .dmd file and the folder of the same name). Name the file **la_oraclemodel.zip.**

    ○ Part of the assessment of your submission will involve your marker extracting your model from this zip, opening it in SQL Developer Data Modeller, engineering to a new Relational model and from this your marker will generate a schema which will then be compared with your submitted schema (they must be the same for your schema to be accepted).

    ○ ⚠ For this reason your **model must be able to be opened by your marker and contain your full model** *otherwise your TASK 3 will not be able to be marked*. **No exceptions.**

    ○ ⚠ For this reason, you **MUST** carefully check that your model is complete on the University lab computers - ensure to take your submission archive, copy it to a new temporary folder, extract your submission parts, extract your model and ensure it opens correctly *before* submission.

⚠ **CORRECT SUBMISSIONS, FILENAMES, AND FILE CONTENTS**

It is your responsibility to ENSURE that the files you submit are the correct files - we strongly recommend after uploading a submission, and prior to actually submitting, that you download the submission and double check its contents.

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5. A schema file (CREATE TABLE statements) generated by Oracle Data Modeller. Name the file **la_schema.sql**

6. The output from SQL Developer spool command showing the tables have been created. Name the file **la_schema_output.txt**

7. A pdf document containing any assumptions you have made in developing the model or comments your marker should be aware of. Name the file **la_assumptions.pdf**

These files must be zipped into a single zip file named
`a1b-<teammember1authcateid>-<teammember2authcateid>.zip`
e.g., **a1b-xyz123-abc468.zip** before the assignment due date/time.
Submit the ZIP to Moodle before the due date.

Your assignment **MUST** show a status of "Submitted for grading" before it will be marked. Please see the screenshot which follows.

Submission status

Attempt number	This is attempt 1.
Submission status	Submitted for grading
Grading status	Not graded

If your submission shows a status of "Draft (not submitted)" it will not be assessed and **will incur late penalties after the due date/time**.

Please *carefully* read the documentation under "Assignment Submission" on the Moodle Assessments page.

High-level Marking Rubric

Please note that this high-level marking rubric is provided as a general guidance to students, which includes (BUT IS NOT LIMITED TO) the following key result areas.
⚠ **You are also required, at all times, to observe and implement the best practices as taught in this unit, in addition to this rubric; this rubric is not an excuse to not implement them.**

	Outstanding (HD)	Adequate (Range P - D)	Not Adequate (N)
Identify the data requirements to support an organisations operations from the supplied case study and expresses these via a database **full** conceptual and logical model. [55 marks]	All Loyalty App System operations are supported: ● All/most required relations identified. ● All relations are in 3NF ● All/most required relationships have been captured by placing FK in correct relation ● All/most required cardinality and participation, as well as labels, have been captured ● All/most data types and data integrity requirements (Entity, Referential, Domain) have been correctly identified	Some of Loyalty App System operations are supported: ● Majority of relations identified. ● Majority of relations are in 3NF ● Majority of required relationships have been captured by placing FK in correct relation ● Majority of required cardinality and participation, as well as labels, have been captured ● Majority of data types and data integrity requirements (entity, referential, domain) have been correctly identified	Few of Loyalty App System operations are supported: ● None/few of relations identified. ● Majority of relations are not in 3NF ● None/few required relationships have been captured. Majority of FKs are placed in incorrect relations. ● None/few of required cardinality and participation, as well as labels, have been captured ● None/few of data types and data integrity requirements (entity, referential, domain) have been correctly identified
Understand and follow normalisation methodology [30 marks]	All/majority of the normalisation steps have been correctly followed: ● All/most normalisation processes are correct ● Dependency diagrams have been provided and match normalisation. ● Normalisation result is correctly integrated into logical model	Some of the normalisation steps have been correctly followed: ● Majority of Normalisation processes are correct ● Dependency diagrams have been provided and match normalisation in the majority of situations. ● Majority of normalisation result is correctly integrated into logical model	Few of the normalisation steps have been correctly followed: ● Significant errors during the Normalisation processes ● Dependency diagrams not provided or have major errors ● Normalisation result is not correctly integrated into logical model
Able to generate and modify relational model and schema given a logical model in SQL Developer. [10 marks]	All/majority of the schema generation processes have been correctly followed: ● SQL Developer Relational model correctly generated from the logical model	Some of the schema generation processes have been correctly followed: ● SQL Developer Relational model correctly generated from the logical model	Few of the schema generation processes have been correctly followed: ● SQL Developer Relational model not correctly generated from the logical model

	● All drop commands, database comments and spool command included ● No "extra" edit in schema file ● The DDL script was executed without errors.	● Some of drop commands, database comments and spool command included ● The DDL script was executed without errors.	● There is "extra" edit (other than identity information and set echo/spool commands) in schema file ● The DDL script was executed with errors.
Able to correctly use the required notation convention and be consistent in its usage. [5 marks]	● All notations in the model are consistent and follow the Logical Model standards.	● Most notations in the model are consistent and follow the Logical Model standards.	● Few notations in the model are consistent or follow the Logical Model standards.
Able to demonstrate consistent A1B work by showing **it to TA staff at least ONCE (refer Section 5) in the weekly tute/lab.**			If not followed, a *grade deduction of 10 marks applied*.