Computer Science – ATAR Year 12

Task 6 – Unit 4

Assessment type: Project: Data Management

Conditions Time for the task: Four weeks. Due at the end of week 6, Term 3.

Task weighting: 20%

A family member has decided to start a new online business and has asked you to develop a working software solution to manage customers and record sales information. Possible examples for your business include a food delivery service, a video streaming service or an online clothing retailer.

Once you have identified a suitable scenario, you will need to conduct appropriate research to provide a description of the system and develop a list of detailed requirements. From this list of requirements, you are to design a solution and then develop the software using a suitable development framework.

In creating your software solution, you should use a combination of Python and SQLite. If you wish to use a different framework, discuss this with your teacher. Only limited technical support will be provided if you choose to do this.

This task has been separated into two parts:

- Part 1 – Investigate and Design worth 40% of the overall mark
- Part 2 – Develop and Evaluate worth 60% of the overall mark

Part 1 (40%)

Investigate

- Analyse the steps required to produce your software solution and develop a schedule for when each of these steps needs to be completed. You should present your timeline in a suitable manner.
- Problem outline –
  - Write a brief outline of the software solution and its objectives
- Problem description – write a detailed description of the required solution. Your description should include:
  - a written description of the scenario which you will develop a solution
  - a list of detailed requirements that your solution needs to include to be useful, including both programming and database requirements. For example, your solution should be able to accept orders from a customer, or your solution needs to be able to give a list of all orders in the last month
  - a discussion of any ethical, legal and/or security issues that need to be considered
  - a description of any factors that may impact the quality of the data stored in your solution.

Design

Once you have established a suitable scenario and problem, you should design a software solution that includes an appropriate database. In designing a solution, you should:

- Develop an appropriate entity-relationship diagram (with a **minimum** of 5 entities). Your diagram should include all primary and foreign keys, but does not need to include any other fields.
- Write the relational notation for the database you have designed.
- Create a data dictionary that will describe the data that you need to store. As part of your data dictionary, you should include a brief overview to describe what information is being stored in each table.
- Describe in plain English several queries that could be used in your database (NOTE: You do not need to write any SQL at this point).

Part 2 (60%)

Develop

You are to create a working software solution based on the design that you have produced. Your system should include a database back end and any necessary software features to make it useful.

Your software solution should include the following features:

- A script to create an initial (empty) database, including the enforcing of referential integrity.
- A script to insert sample data into the database that provides enough data to allow the system to be thoroughly tested
- Data validation to ensure the integrity of the database. This should be done using constraints within the SQL for each table and within the code to ensure there are no run time errors and any user data entry is valid.
- A number of different queries that will allow the user to extract useful information from the database. When developing your queries, you should develop different queries to fulfil the following criteria:
  - use of aggregate functions such as COUNT, SUM, AVG, MIN and MAX
  - use of clauses such as GROUP BY and ORDER BY
  - use of JOINS to retrieve data from a number of related tables
  - use of calculated and concatenated fields with aliases
  - ability to insert, update and delete records.

NOTE: You should ensure that you use a sufficient number of queries to use data from all the tables in your database. Your queries should also be complex enough to demonstrate your understanding of SQL.

- Any other software features you feel may improve your software solution. For example, you could:
  - provide a suitable method to present the results of queries to the user
  - export query results to a text file

- provide an interface for the user to insert, update and delete records.

Evaluate

- Reflect on the success of your solution and how well it meets the system requirements. To perform your evaluation, you should:
  - consider how well your solution meets the requirements you outlined in Part 1
  - consider the ER diagram you developed in Part 1 and compare it to the structure of your finished database. Discuss any differences and explain why you have made these changes.
  - consider what extra features you implemented and what aspects of the solution could be improved.
  - document any known bugs and/or limitations in the solution and explain how they impact the performance of the solution.
- Perform a developer retrospective and reflect on the process you followed to develop your solution and how you could improve this process. Some aspects you should consider include:
  - what worked well?
  - what didn't work well?
  - what would you do differently next time to improve the development process?
- Document the sources you have used to get information about how to develop your solution, including all websites and textbooks.

Note: This task requires authentication to ensure students complete the work themselves. Some methods of authentication could include:

- Students taking screenshots of their code on a regular basis.
- Students using tools such as GitHub to demonstrate regular updates to their code.
- Students providing verbal explanations of their project and how it works.

Part 1 (40%)

Investigate	Marks
Development Schedule	
Breaks down the project planning into a series of meaningful steps and a realistic timeline for completing each step has been included	2
Breaks down the project into a limited series of steps with some attempt at showing a timeline	1
Subtotal	**/2**
Problem Outline	
Accurately outlines the purpose of the software solution	1
Subtotal	**/1**
Problem Description	
Provides a clear and detailed description of the scenario	2
Gives a limited description of the scenario	1
Subtotal	**/2**
Requirements list	
Provides a clear and detailed list of requirements that fully meet the needs of the problem description. Suitably classifies requirements	3
Provides a list of requirements that mostly meet the needs of the problem description. Partially classifies requirements	2
Provides an incomplete list of requirements that meet some of the needs of the problem description. Makes a limited attempt at classifying requirements	1
Subtotal	**/3**
Ethical/Legal/Security Issues	
Provides a clear and detailed discussion of appropriate ethical, legal and security issues that are relevant to the development of the software solution	4
Discusses legal, ethical and security issues regarding the development of the software solution	3
Limited discussion of several legal, ethical or security issues regarding the development of the software solution	2
Has identified a legal, ethical or security issue regarding the development of the software solution	1
Subtotal	**/4**
Data Quality	
Describes all relevant factors that will affect the quality of the data in the solution	3
Describes some relevant factors that will affect the quality of the data in the solution.	2

Identifies factors that may affect the quality of the data in the solution	1
Subtotal	**/3**
Total	**/15**
Design	**Marks**
DESIGN	
ER Diagram	
All necessary entities have been included, named appropriately and any many-to-many relationships have been resolved	4
Most entities have been included and named appropriately, or all included but not named appropriately	3
Some entities have been included	2
Limited entities have been included	1
Subtotal	**/4**
All relationships between tables have been included with correct cardinality indicated on each relationship	4
All relationships have been included although cardinality may be incorrect, or most relationships have been included with correct cardinality	3
Most relationships have been included although cardinality may not be correct	2
Some relationships have been included	1
Subtotal	**/4**
All primary and foreign keys have been included and have been placed in the correct entities	3
Most primary and foreign keys have been included in the correct entities	2
Some primary and foreign keys have been included in the correct entities	1
Subtotal	**/3**
Relational Notation	
All entities have been included with all primary and foreign keys indicated appropriately. All necessary non-key fields have been included and the correct notation conventions have been followed	5
All entities have been included, although some key fields have not been identified correctly or some non-key fields are missing	4
Most entities have been included with all necessary key and non-key fields indicated appropriately	3
Most entities have been included, although some key and non-key fields are missing	2
Some entities have been included	1
Subtotal	**/5**

Data Dictionary	
All entities have been included with a brief overview of each entity. All primary and foreign keys have been included for each entity with appropriate details included for each field	6
All entities and key fields but some details not included for each field	5
Most entities and key fields for all included entities with appropriate details	4
Most entities and key fields however some details not included for each field	3
Design	**Marks**
Some entities and key fields with appropriate details for fields	2
Some entities and key fields however some details not included for each field	1
Subtotal	**/6**
All necessary non-key fields have been included for each entity, with appropriate details included for each field	4
All included but missing details, or most included with all details	3
Most included but missing some details	2
Some included	1
Subtotal	**/4**
Total	**26**
Total Part A	**/41**

Part 2 (60%)

Develop	**Marks**
DEVELOP	
Create database	
A database has been produced that accurately reflects the ERD and data dictionary. Any changes from the original design have been documented	2
A database has been produced with some errors	1
Subtotal	**/2**
Database effectively enforces entity, domain and referential integrity through use of constraints in the CREATE queries	3
Database partially enforces data integrity through the use of constraints	2
Database attempts to enforce some data integrity	1
Subtotal	**/3**
Insert data	
Appropriate data inserted into database to allow database to be tested thoroughly	3

Develop	Marks
Some data entered into database although insufficient to thoroughly test all aspects of the database	2
Limited data entered into database	1
Subtotal	**/3**
Data validation	
Database solution uses Python to thoroughly check the validity of data entered by the user. The database solution provides suitable error messages to the user to explain errors	3
Database solution uses Python to check the validity of most data entered by the user	2
Database solution uses Python to check the validity of some data entered by the user	1
Subtotal	**/3**
SQL Queries	
Note: It is possible for a query to earn marks across more than one of the categories below	
An appropriate number of working queries have been written that demonstrate a sufficient level of complexity and covers all tables in the database. All queries extract meaningful information from the database	3
An appropriate number of working queries have been written that cover most tables in the database	2
Some working queries have been written	1
Subtotal	**/3**
Queries demonstrate use of multiple aggregate functions to extract meaningful information	3
Multiple aggregate functions have been used to produce working queries	2
Attempts to use aggregate functions	1
Subtotal	**/3**
Queries demonstrate use of both GROUP BY and ORDER BY to extract meaningful information	3
GROUP BY and ORDER BY clauses have been used to create working queries	2
Attempts to use GROUP BY and ORDER BY clauses	1
Subtotal	**/3**
Queries use JOINS across multiple tables to extract meaningful information	3
Joins are used to create working queries	2
Attempts to use JOINS across a minimum of two tables	1

Develop	Marks
Subtotal	**/3**
Queries make use of calculated and concatenated fields to manipulate the results of the query. Queries use aliases to make the results of the query more meaningful	3
Uses calculated and concatenated fields to create working queries	2
Attempts to make use of calculate or concatenated fields in a query	1
Subtotal	**/3**
Queries have been written that allow the user to insert, update and delete records from the database	3
Queries have been written that allow the user to do two of the insert, update or delete records from the database	2
Attempts to create an insert, update or delete query	1
Subtotal	**/3**
Other Features	
Suitable extra features have been implemented effectively as part of the solution that allow the user to better interact with the database	5
Suitable extra features have been implemented that allow the user to interact with the database	4
Some extra features have been implemented	3
Implemented an extra feature as part of the solution	2
Attempted to implement some extra features as part of the solution	1
Subtotal	**/5**
Product Evaluation	
Provides a detailed evaluation of how the solution meets the requirements identified in Part 1, including discussion of design changes that have been made	3
Describes how the solution meets the requirements identified in Part 1 or describes changes to the database design	2
Makes a superficial comment about how the solution meets the requirements identified in Part 1	1
Subtotal	**/3**
Provides a detailed discussion of how the final product could be improved and documents any bugs and/or limitations	3
Describes how the final product could be improved and documents some bugs and/or limitations with the solution	2
Makes a superficial comment about how the final product could be improved or identifies bugs	1
Subtotal	**/3**

Develop	Marks
Retrospective	
Provides a detailed evaluation of the development process and suggests future impacts	3
Completes an evaluation of the development process that was used including some suggested future impacts	2
Makes superficial comments on development process used and suggested future impacts	1
Subtotal	**/3**
Total Part 1	**/41**
Total Part 2	**/43**
Total	**/84**

Acknowledgements

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Cisco Systems, Inc. *Network Topology Icons.* Retrieved September 2022, from
https://www.cisco.com/c/en/us/about/brand-center/network-topology-icons.html