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1.1 The Training Centre as a Database Project

The Training Centre proved to be a very good choice for a project in database modelling and implementation. Its wide range of requirements meant that a relatively complex design was necessary and the skill base acquired during the O.U. course M357 - Data Models and Database was extensively broadened and developed in a simulated real-life situation. One of the main lessons learned while carrying out this project was the value of interaction with the client themselves. Where ambiguities in the data arose, design decisions had to be carefully considered and defended in the light of the documentation available. An example of this is the requirement that all Courses must be led by a Manager when the data supplied clearly identified Advisors as Course Leaders - consultation with the Client would have verified the correct interpretation.
A number of complimentary factors needed to be considered if the Centre targets were to be met, some of which only became obvious as the Project progressed. These included assessing the value of resources both human and physical on the profitability of the Centre's day to day activities and the methods in which this data could be obtained. Decisions made during the Conceptual Modelling phase had repercussions throughout the project. One of these was the decision not to include items which could be calculated from other data in the database. While in theory this decision was realistic and kept data redundancy to a minimum, in practice caused a number of serious problems. A specific example of this is the extraction of marketing information from the Surveys taken at the end of each Course, where it proved impossible to directly determine the difference between the numbers filling in the questionnaire and the numbers attending the Course while extracting other information from the participants answers.

1.2 Technical Considerations

1.2.1 The Conceptual and Relational Models

The initial approach taken to the Project was to produce a Conceptual Model which adequately reflected the Requirements documentation while conforming to the constraints

imposed. Initial perceptions led me to expect that the Conceptual Model would be relatively easily mapped onto a relational schema with the major difficulty being the specification of the correct relational algebraic syntax to reflect the constraints listed. The List of Data Items proved invaluable when considering the Domain declarations as these were grouped in compliance with the values indicated.

In the event, some initial constraints had to be regarded as assumptions since they proved difficult to implement in the Relational Model . An example of this is the premise that a classroom can only be used for one Activity at a time or that a Tutor assigned to more than one course on a specific day could only be allocated to one course at a time - this would have required an extension of the database to include a time-tabling facility which was deemed beyond the parameters of this project.

As a result the Conceptual Model was revised continually during the project taking both tutor comments and further requirements arising from the mapping of the Conceptual Model onto the Logical Relational Schema.

While I appreciate that the conceptual model is supposed to be designed without regard to the logical or physical design, I would spend more time in future projects ensuring that the data requirements and constraints were more practically reflected in the modelling process.

1.2.2 Database Implementation

The transformation of the Relational Schema into SQL posed few problems. Again, one of the most useful pieces of documentation at this stage was the List of Data Items generated during the Conceptual Modelling Phase. The data type specifications outlined in the domain declarations being replaced in each case by the actual data type and length from the list of data items. For example, the Domain IdentifiersOfPersons which was declared in the Relational Schema as (P00001..P99999,S00001..S99999) and in the List Of Data Items as StaffID with a value set of X(5) was defined in the SQL schema as having a data type of Char(5).

The conversion of Relations into Tables in the SQL schema was relatively straightforward if time consuming. Accurate data entry was vital as the editing facilities in DBQ are very limited and a mistake made in the definition of a Table or Column name could not be rectified without redefining the entire Table.

The inability of DBQ as a database management system to directly implement Primary Keys, Referential Integrity or Constraints has been outlined and discussed in detail in Section 5. Much of the time spent in this Project designing Stored Queries to check the integrity of the database would have been saved in a more modern DBMS which would have implemented such requirements directly while writing the SQL Create Table statements using Primary Key declarations, Foreign Key references and Check constraints. When ‘going live’ with this database, the client would need to be issued with a list of the stored queries generated in Section 5 together with a full description of their purpose. The necessity of running these queries on a regular basis to ensure database integrity would have to be stressed to the person within the Training Centre allocated the role of database administrator.

Inputting the data into the database needed to be carefully planned and organised. The data available in the Project Guide was used extensively, and a decision made to create the unique indexes before the database was populated proved opportune as any inconsistencies were picked up at an early stage.

One of the most interesting aspects concerned the trade-off between processing speed and the design methodology which is based on the objective of normalisation. In extending the DB for the additional requirements it was found that query processing times were unacceptable and that the inclusion of a minor amount of redundant data could significantly improve

performance. This highlighted for me the more general point which relates probably to all RDBMS's and methodologies - there is never one entirely correct method of design and implementation - pragmatic considerations centred on user requirements should be of the uppermost importance.

1.2.3 Using the Database - Difficulties using DBQ

Once the database had been set up and populated, a comprehensive testing procedure to ensure compliance with the database design and client requirements was carried out. A considerable amount of time was spent in designing queries which subsequently did not work in DBQ as expected. One of the most frustrating of these involved attempts to use calculated data from one table with data from other tables where outer joins would have been required. i.e. maintaining the data of the first table even if it did not appear in the second. The DBQ SQL error messages were generally too insufficient to be really helpful. In a number of cases what first appeared to be minor queries of the database needed extensive SQL constructions to provide answers.
Calculations using Date and Time fields also caused major problems. Date difficulties were overcome by using a Diary which included Day and Month fields, time calculations were the most difficult and this problem was resolved by using a text field to record the time and manually calculating the time differences.
The capacity for the creation of Views and in particular the facility to store queries in DBQ were invaluable in carrying out this project. Many of the queries including their formatting information which used GROUP BY or UNION clauses and which could not be represented as Views were saved as stored queries which could be STARTed and run whenever required.
Difficulties in printing using PRINT ON LST: from DBQ caused the PC to crash on many occasions. In general, although the report could be formatted in DBQ - looking reasonably well on screen, it was easier to export the file as text file and format it using a Word Processor. Given that the Training centre is currently teaching word processing, it is a reasonable assumption that the facilities and expertise to carry this out exists among many of the personnel involved.

1.2.4 Overall Technical Conclusions

My expectations at the start of this project were that the original model would only require minimal changes which would be incorporated without too much difficulty. However, as the project progressed, it became apparent that the process was one of continual iteration. As data requirements and implementation considerations were checked against the model, further changes were constantly required. From a technical point of view, derived items would be included in the design phase of future projects and the algebraic representation of the constraints would be kept to a minimum.

1.3 Wider Database Issues

While the specifications set out in the requirements document can be checked as outlined using DBQ, there are a number of Management issues which arise for the Training Centre. These include decisions that must be taken as a result of the output from the database. For example, corrective action must be taken if a query gives information which infringes one of the specific requirements e.g. if a Manager appears (as is the case!) who has no responsibility for any course.
Other issues include the Human Interface of the database as presented to its Users. DBQ has adequate facilities to format database Views and Stored Queries so that they are acceptable to

the end Users. Where possible a series of commonly used requests should be set up as Views so that the required parameters could be input. Where this is not possible, stored queries can be used and the end-users trained to recall the query and change the details as necessary before running the query.

1.4 Project Management

1.4.1 Task Definition

Dividing the Project into specific areas and determining their relative importance was aided considerably by the TMA's and the way the topics were covered in each. The idea of a Log Book was particularly helpful in that it served as a reminder to write decisions down as they were being made rather than trying to remember why a specific decision was taken at a later stage. The experience of writing the initial reports was invaluable when formulating the final project. Tutor comments and advice was gratefully received and incorporated.

1.4.2 Time Management

The time allocation for this course in the Project Guidelines was stated as 160 Hours overall. This proved to be a considerable underestimation in practical terms, Each section over-ran by at least 50% - 60 Hours for TMA 01 and 10 Hours for TMA 02. The final part of the project and the production of this final report is estimated at 110 hours. However, a disproportionate amount of this time was used in the implementation and testing phases and in designing SQL queries to satisfy the database requirements. The resultant familiarity and expertise gained with both SQL syntax and DBQ would mean that these would be accomplished more efficiently in any future project.
In future database projects, less time would be spent on the initial stages of the design and thereby reduce some of the iterations required during this project.