# 4.0 Final evaluation of database

## User and client requirements:

Overall, the completed database meets the requirements of the client, the client has specified that the database is to store data for Workplace4Training for data such as students, courses, assessors and venues. The table structure of the database allows for the appropriate relationships between each record in each table meaning that the database is suitable for its role in storing and managing students and the courses they are on.

Additionally, the database carries out all the set-out functionality in the clients' requirements, the database can perform operations such as modifying a student's record either to update some fields within the record and to add the student achievement. The database has also had reporting functionality built into it, with a dedicated form created for managers to be able to access reports. The database contains 4 main reports which each collects data from the appropriate tables.

These 4 reports are the course booking, course popularity, course performance and trainer performance reports. Using these reports, the manager view which ever data they need to see about the database. E.g. If a manager wants to see the performance of students across one course, the manager can click a button on the report form to view the “course performance report” which will list the percentage of students who have achieved the course. Using built in Access reports is very beneficial as reports can have access to queries and various other features such as printing which means that reports can be easily printed and archived.

## Quality of the relational database:

The database has been designed from scratch from the old system using a list specified by the client about what the database should store. The client has provided a list of data which has to be available in the database, using this list of data, the database table structure and the resulting relationships have been planned and documented. The list of data has gone through the complete process of normalization providing a fully functioning and error free database.

Using normalization means that the appropriate relationships between each table can be setup, using relationships in the database means that many of the processes to viewing and modifying data in the database are fully automatically. This provides an advantage as records in the database can be linked together. For example, if a manager needs to find out what venue a course will be held at for an assessor, the manager can use the established relationship between the course table, course schedule table and finally the venue table to find the venue record which the course has been linked to rather than manually searching through the database, the database can automatically look up this value.

The use of normalisation and relationships in the database also comes with the advantage of referential integrity and cascading updates. When a record in the database needs to have its data changed, the database only must update the data in that record once. Normalisation aims to reduce repeating data as if data is repeated multiple times within a database, the data can be mismatched. This is because when that piece of data needs to be updated, each record which contains that repeating data will also have to be updated. This is prone to errors as if the change is missed for that field/data in one or more records, the data mismatch will occur which can result in confusion, frustration and more severely, lost data.

Instead of repeating data, normalisation will instead fill each record which needs to access that repeating data have a reference to another table which contains the data needed. E.g. If the student records each contain a reference ID to a course, and the course contains a reference to a venue, if the venue of the course must be changed, only the venue record must be changed once instead of updating the venue per student.

Additionally, the database provides an easy to use and accessible method for users to interact with the database, users do not have to directly interface with the database through Access to perform the action they want. Instead, I have setup forms which are mini-GUIs embedded in the database which connect to the database functionality to provide an extra more user-friendly layer of interaction. Instead of for example, adding a new student to the table directly, which may be confusing to some users, there is a form setup dedicated to handling adding new students to the table. The form contains widgets/controls such as textboxes, combo/dropdown boxes and buttons which link to the table where the user can enter in the data which the new student record will contain.

## **Fitness for purpose:**

The goal of this project was to replace the original databases which assessors/users/managers had trouble with due to frustration. The result of this project needs to be a produced database which must check each criterion of specified functionality and use for Workplace4Training to be able to integrate the database into their organization for use. The produced database has met all these requirements as it provides a new relational database which addresses the previous concerns with the old system while providing extra functionality such as reports and forms.

## **Suitability against the original requirements:**

The original requirements of the database specified by the client was a relational database which stores data about students, assessors, courses, venues and course schedules. Additionally, the requirements have also specified that the database is to carry out special and specific functionality such as creating reports and providing a user-friendly method of interaction with forms.

Workplace4Training needs the database in order to store the information needed for the organization to function. The new database eliminates many of the concerns addressed by managers and assessors when trying to use the old system/database. Some of these concerns like having to manually update each individual record across multiple databases when one singular bit of data was changed, the implementation of the new relational database has eliminated this concern in the design of the database and the type of database being relational which is perfect for requirements such as these.

## **Legal and ethical constraints:**

Since the database will be ran by an organization, the organization (Workplace4Training) will be subject to various data protection and privacy laws such as the Data Protection Act (1998) and GDPR (2018). The laws provide guidelines on what companies and organizations are and are not allowed to do with customer data Aswell as additional rules for data protection. These laws must be complied with as the database cannot be used if it isn’t compliant.

Examples of what these rules enforce is complete transparency in what data businesses have stored about customers or people who have data on them in the database. Users/Customers (in this case students) must be able to see what data the organization has stored about them; this may mean that the record in the database stored about the student must be provided on demand. This in and of itself isn’t too much of an issue as the appropriate student's record can be retrieved and sent to the student.

However, where there may be issue is with data security and breaches, in addition to increased rights of users/customers regarding access to their data, GDPR and the DPA also need organizations to ensure that data confidentiality is held up regarding all user/customer data. This means that organizations must ensure that all breaches and data leaks are prevented at all costs, failure to do so will result in fines up to 4% of the organizations total profits. Data breaches if severe enough, or recurring enough, can also come with more severe punishments such as a total ban on any kind of data storage about customers/users, this would not be ideal and will mean that the database is unusable.

To avoid the issue of security breaches, the database administrators and organization must ensure that data is not accidently or purposely leaked. This can be done by using methods such as encryption with the database being password protected. The database has had a password setup so that anyone who tries to access the database without the password (likely for malicious purposes) will be unable to access the database. The password set to the database acts as the encryption key to the database meaning that no matter what, even if hackers get access to the database file/steal the file, the database will still be protected as it is encrypted.

## **Technology constraints:**

The platform used to implement the database is Microsoft Access, Access was chosen for the database for its advanced functionalities such as reports, forms and query builders while also handling many backend things such as referential integrity. Access is suitable for this purpose because it its intended to be used by small organizations as opposed to other database software such as SQLite or MySQL. However, developing on Access comes with its own difficulties due to bugs and errors present in Access which may affect the database either in development, testing or live use.

Access also comes with a minimum set of system requirements; Access is a large application which performs many complex tasks and processes meaning that it will need a somewhat powerful system. Microsoft has listed a specification of minimum system requirements for Access and subsequently the database to function, even if a system meets these system requirements, Access can still be constrained by poor hardware as the database can still be slow or crash.

This will mean that any user with a device which needs to access the database will have to ensure that the device they are using meets the minimum system requirements set out on Microsoft's website.

## **Strengths and alternative solutions that could be implemented:**

The advantage of using Microsoft Access is the quick and easy creation of new databases, Access will do most of the work while the segments of the database and components attached to the database such as user interfaces are being created. For example, Access has a built in SQL engine for creating queries, this query engine can be used to manually write queries or alternatively, queries can be generated automatically by filling in the information which the query needs to retrieve.

Access also provides great tools regarding interfacing with the database, Access has support for GUI/form mini applications within the database which can be setup to interact with the database. Forms can be created for any purpose such as viewing data, creating and viewing reports, modifying records within tables, deleting records, adding records and many other actions.

However, Access fails regarding compatibility and in errors/bugs. The latest most supported versions of Access (currently Access 2019) are only available on Windows 10 and 11, any other operating system or older version of Windows does not support Access meaning that users are limited in the choice of operating system if they need to regularly access the database. Other database management systems such as MySQL and SQLite do not face this issue as both have been written to be compatible across most operating systems including MacOS, Linux and Android.

## **Platforms and compatibility:**

Since Access has been used to implement the database, the database is only compatible with operating systems and systems which are also compatible with Access meaning that certain platforms may not be supported. Because Access is a large complex application, Microsoft hasn’t attempted to port Access to other operating systems such as MacOS and Linux and is only available on Windows 10 and 11.

This presents an issue with the database as users who need to access the database on other operating systems such as MacOS, Android, Linux or older Windows versions will be unable to use the database. Microsoft Access is setup not only as a database creation software, but also a management and general use software for Access created databases, this means that to use a database created in Access, Access must also be used to open the database.