Milestone Three: DBMS Research and Recommendation

Southern New Hampshire University

Principles of Database Design

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**Background History**

A database management system (DBMS) is a collection of programs that allows users to store, change, extract information from a database, and it allows users to control data efficiently, it also provides users with the ability to perform multiple tasks simultaneously (Beal, 2017, para. 1). Furthermore, using DBMS enables users to manage large quantity of data within an application, which enables business to increase their system efficiency, and it reduces the operating cost associated with database management systems, which is exactly what Grandfield college needs to create a more operational system (Aveda, 2015, para. 1).

With the proper DBMS in place institutions such as Grandfield college will achieve efficiency in handling multiple data types, some is easily manageable, such as student records, library information, and inventory, while, there are system that much more complex to meet its user’s needs (Aveda, 2015, para. 2). As specified in Milestone One, the law requires that any business, including a school, track its software, know what software the school owns, in what versions, and what the license agreement for that software is available (Conger, 2014). Despite the type of license, the software poses it is important to know which software installation is on which machine, the location of such machine, and which users have access to that machine, and it is also important to track when the uninstallation of software from a machine, and the system needs to track all retired machines (Conger, 2014). Which is why Grandfield college needs to implement a DBMS that manages concurrency, security, data integrity and consistent administration procedures, that offers a centralized view of data accessed by different users, from different location, in a controlled environment (Rouse, Mullins, & Christiansen, 2005-2017, para. 2&3). Having the capability to process data will enable Grandfield to launch a database system based on integrity with exact information, knowledge and with the wisdom to continually make decision that are founded on data relevancy, as this creates information that is complete, accurate, consistent, meaningful and usable to the organization ("Data Management Companies," n.d.).

**Types of Database Management System**

There are many database management systems that are based on data models, these include, Relational databases management system, Hierarchical databases management system, Network databases management system, Object-oriented databases management system (Panwar, 2011).

**Relational Database Management Systems**

(RDBMS) are the most widely used database management system, as it is very user-friendly, offering characteristics of normalizing data stored in tables that relies on normalizing data within rows and columns in tables (Obbayi & Carson, 2017). Additionally, in a relational database system, relationships are possible between data within the same table or other tables, but only if such table(s) are managed by joining one or more tables, it also has abundant processing power, good memory life, and the data is stored a predefined structure that can be manipulated by using Structured Query Language (SQL) (Obbayi & Carson, 2017). The relational database management systems include Oracle, MySQL, DB2, while non-relational database management systems include NoSQL DBMS, which involves a less strict define schema than RDBMS (Mullins, 2005-2017).

**Hierarchical Database Management System**

While hierarchical database system is very fast and simple, records containing information about their groups of parent/child relationships, it is just like as a tree structure with repeating information, where data follows through a series of records with a set of field values attached to it (Panwar, 2011). Furthermore, it collects all records together as a record type, these record types are the equivalent of tables in the relational model, and with the individual records being the equivalent of rows, it allows for the creation of links between these record types, the hierarchical model uses these type Relationships. Hierarchical database is useful for storing songs, recipes models of phones and items stored in a nested format, as it is not efficient for real world operation, but it allows users to store items such as, a database of songs, recipes, models of phones and anything stored in a nested format, an example of a Hierarchical database management system is an XML document (Obbayi & Carson, 2017).

**Network Database Management System**

A network database system works best on large digital computers, as it allows for many parent to many child relational model, and its structure is based on records and sets, using SQL for manipulation of their data (Obbayi & Carson, 2017). there are limitations when using this kind of database, despite being like the hierarchical databases in structure, network databases appear to be interconnected network of records (Panwar, 2011).

**Object-oriented Database Management Systems**

Object-oriented database management systems borrow from the model of the Object-oriented programming paradigm, its data is one ad accessed through pointers rather than stored in relational table models, and it consist of diverse structures that is expandable (Obbayi & Carson, 2017). This type of database system is intended to work with programs that have Object-oriented programming languages, as it makes the data and the program works as one, applications are treated as data as native code (Obbayi & Carson, 2017). Some examples of Object-oriented database management systems include IBM DB4o and DTS/S1 from Obsidian Dynamics (Obbayi & Carson, 2017), to name a few.

While there are many different types of database management system, RDBMS is one of the most popular, it has some benefits that the other database system does not, causing this type of system to be one of the most user-friendly systems, example of this type of system is Oracle, which has many capabilities that fits Grandfield’s needs. Oracle is versatile from changes of direction in hardware and operating systems as it is ported to many platforms. Oracle also offer industrial strength for on-line backup and recovery and is also good at software fault tolerance (An Oracle White Paper, 2003), which is very useful feature for Grandfield College since it is assures its customers that none of their data will be loss, and in case of a loss of data they can recover it on-line using their own program. The major disadvantage of oracle is the cost, Oracle in comparison to other versions of SQL is ten times as high, because it is a composite and exceedingly specific language that is hard to find competent database administrators. Oracle is more difficult to learn and has many customizations which may cause the IT department in Grandfield to face some challenges.

Another type of RDBMS is IBM(DB2) it runs on multiple platforms is stable and is easily scalable, despite the advantages this database offers Grandfield College, DB2 has disadvantages that may cause hindrances from selecting the database management system, as it is not as robust as oracle. DB2 also is expensive but not as much expensive compared to oracle, it will need administration or an expert in DB2 and there are few people with the knowledge of DB2, which can cause some challenges for the institution.

MySQL is another widely used database management system which is a product of oracle and its free, it offers its users all the technical support that other database system, its stable, it runs on multiple platforms, and is easy to use. However, MySQL does not have many features, it does not support large databases efficiently, which can pose a problem for Grandfield as a big institution this makes it to be a big failure ("DB2 vs. Microsoft SQL," n.d.).

NoSQL DBMS authorizes a more flexible schema, where data elements need for every entity, offering a more relaxed, consistent approach, it is easier to work with large amounts of sparse data, but it also ends transactional integrity, flexible indexing, and ease of querying (Mullins, 2005-2017), which RDBM does not do. Non-relational database management, in definition, refers to a database that does not include the table/key form that is characteristic of relational database management systems (RDBMS). These types of databases need data handling techniques and procedures designed to deliver solutions to big data difficulties that big businesses battle. The most prevalent emergent non-relational database is christened NoSQL (Not Only SQL). The non- relational database management system products are the future of database, although they are not stable in the market. The advantage of non-relational database management systems includes the followings aspects. Firstly, they have adaptable scalability, while, RDBMSs are not as simple to measure out on product groups, while NoSQL databases are developed for clear development, taking benefit of innovative nodes. These databases, therefore, are intended for usage with minimal-cost product hardware. Secondly, they are big data applications, whereby we expect the Grandfield College data to increase with time then NoSQL would be the best fit for this. Thirdly, the database administration is less expensive compare to Oracle, since NoSQL need much lesser hands-on administration, with data circulation and auto restoration abilities, abridged data representations and scarcer tuning and management necessities though, someone is needed to care for functioning and accessibility of the database.

The disadvantage of non-relational database management system products are as follows, they are less mature, less stable, and there is no advanced ability in the field of non-relational database management system products because NoSQL databases are new in the market. Grandfield College needs to have the assurance that ought to serve a key purpose if the data administration system flop, they will have admission to knowledgeable support in a judicious way. All the RDMBS merchants have made inordinate effort to guarantee that such facilities are obtainable. NoSQL database in dissimilarity is open-source, with merely one or two companies managing the support approach.

Based on the research above, the non-relational databases management system cannot be implemented in Grandfield College since they are not stable, they have no available support and their no advanced ability is the administration of the non-relational database management systems. It will cause the data manipulation at Grandfield College to be inefficient, data will be insecure whereby data could be handled by unauthenticated entities, there will be inadequate file transfers and there will be high chances of duplication of data.

**Recommendation**

Based on Grandfield college needs the recommended DBMS product is Oracle, despite oracle being expensive in the administration, the advantages of Oracle are quite useful to the college. Oracle SQL has improved performance, it allows for multiple servers to work on the same database with the Real Application Cluster features ("Oracle Database," 2017). This can significantly increase the organizations processing power for only the price of an added server, with Oracle SQL also organizations such as Grandfield have more options to fine-tune their database operation to suit their capabilities of your server. With this feature, there will be adequate file transfers and the speed will be enhanced, and since Oracle SQL is versatile, it will give the institution the flexibility of choosing to run the database in any operating system, with the option of installing Oracle SQL on a Unix server and benefit from the reliability of Unix while keeping the standardization of SQL ("Oracle Database," 2017). Unix is less vulnerable to many common computer viruses, which keeps your information secure, and Oracle SQL is also backward-compatible, offering the choice of upgrading in the future without losing any data. Oracle SQL also support declarative integrity whereby Oracle V7 onwards supports declarative database integrity, and V6 permits you to enter the declarations ("Oracle Database," 2017). Oracle Database 12c provides multi-layered security including controls to evaluate risks, prevent unauthorized data disclosure, detect, and report on database activities and enforce data access controls in the database with data-driven security ("Oracle Database," 2017).

**Platform, Hardware and Software Requirements for Oracle**

("1 Hardware and Software Requirements," 2011)

*Supported Platform*

Oracle Linux 5 Update 5(with the Oracle Unbreakable Enterprise Kernel for Linux).

*Hardware Requirements*

The minimum hardware requirement is disk space of at least 10 GB (including at least 2 GB for the software files in the Oracle home directory and at least 8 GB disk space for the data files).

*Software Requirements*

The server operating system in which Oracle SQL is embedded could be:

AIX, HP-UX, Linux, OS X, Solaris, Windows, z/OS.) as for Grandfield college we need a Linux server operating system ("Oracle", 2017).

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