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# 1.Evaluate the role and suitability of Database Management Systems (DBMS) in the Healthcare sector.

## DBMS Roles –

### Definition-

DBMS are used to manage databases, this is mostly to create new data, read, and modify the data (update and delete). This also allows for the data to be easily accessed by users. The overall role of DBMS is reduction in data redundancy, use of multiple users, ease of access. (What is a Database Management System? - Definition from WhatIs.com, n.d.)

### Applications/purpose of them

DBMS come in many forms for various businesses/tasks, the main applications DBMS can fall under is:

Banking- DBMS are used within banking for the use of processing transactions, the implementation of this allows for transaction to take place without going to the bank. Furthermore, this is used to store customer information i.e. account information so online banking can take place. This allows for a better tracking of money.

Human resource management- HR used DBMS to record the total number of employees, what work or department they are in, salary, tax codes and pay checks. This allows for the company to regular manage employees and adjust their pay or tax codes and transfers of departments.

Airline reservation system- reservation systems such as airlines but not limited to, i.e. railway, use DBMS to keep records of arrivals, departures, delays, amount of people boarding and locations. This allows for the maximum possible tracking and records in case any incidents occur. (Sharma, 2017a)

## DBMS Suitability

### Suitability

DBMS suitability varies per say on the business/organisation using them and there are many factors in which need to be evaluated to see whether it would be suitable for them. The main factor is what type of data would you be handling. would the data that is being collected be consistent with what is needed? Consistency rules would need to be implemented effectively to make sure the data is relevant and the ease of defining them in the DBMS should be considered. The use of multiple users at once should be a factor and the integration within workflow. Would the implementation of it be easy? Would the cost of purchasing it be viable + updates? The overall integration and support for the DBMs needs to be considered plus the TCO (Total Cost of Ownership) needs to be evaluated, prices vary and is on the most part expensive. Websites provide an estimation price of the development and maintence cost of the solution. (Should You Build or Buy A DBMS? – Free Online Calculator, n.d.); (Obermeier, 2018);

### Advantages and disadvantages

However, there is advantages and disadvantages to using a DBMS:

The main problems to this solution are complexity, this is due to the requirements it fulfil and problems it solves but generally competent use or knowledge of it should be employed otherwise potential data loss or downtime can occur. Size and performance, this using a lot of physical resources (Hardware) but also storage as well which can cause bottlenecks, due to how large it is relatively slow small scale but effective for larger scale organisations.

However, the good areas of a DBMS are the heightened data security which lowers the chance of data breaches. Due to the higher level of maintained data, better decisions can be made through the use of information provided through the DBMS. The ability to lower data inconsistency through the development of a robust database. (Advantage and Disadvantages of DBMS | DBMS |Tutorialink.com, n.d.); (Sharma, 2017b)

# 2. Analyse the importance and effectiveness of information systems in the Healthcare sector.

## Introduction

Healthcare Information systems are designed to collect, store, modify and manage data relating to patients and other medical information accurately. These are used to access patient info effectively and quickly allowing for the most recent info for patients.(Types of Healthcare Information Systems - Scott-Clark Medical, 2018);

## Importance

An information system which is commonplace within health care is EHR Electronic health record system, this is used to store a digital copies of patient information into a large database comprised of thousands of records. This is important because it allows for the medical staff to safely access any information on patients. The importance of this is that the information is immediate, no matter if the patient is at another healthcare facility in case there is a potential emergency.

Digitally storing the information is much more efficient then using a paper-based alternative as this takes up a great deal of storage as well as a longer process to retrieve and update information for the patients. Information systems allow for general updates to the system as well as the patient records without causing major disruptions and time constraints.

Furthermore, the use of HIS (Health Information Systems) will enable for resource planning on the maintenance of the system and supplies. This is greatly beneficial as the resources that would be used in a paper-based alternative can be used for the patients giving them a better quality of service/treatment. This also greatly saves on time overall and will greatly increase the efficiency of management and the coordination for the caring of patients subsequently leading to higher satisfaction within patients if the HIS’s are deployed and maintained correctly.

(Adaba and Kebebew, 2018); (Cyganek et al., 2016a); (The Importance of Information Systems in Healthcare, n.d.)

## Effectiveness

Since the medial industry has started to use computers and communications systems. The introduction and use of HIS have greatly improved care and added benefits. Without these systems cost and resource would dramatically rise, and patient care and satisfaction would drop. (Owusu Kwateng et al., 2019)

PMS (Practice Management software)

This is used to automate tasks and help with the operations of the facility/s daily. This mainly focuses on the automation and scheduling of patients for appointments and will be implemented in all healthcare facilities regardless of size.

The usefulness of this is for the improved efficiently is great, however PMS is trying to develop to automate many of the administrative tasks which has been incentivised by the building of AI within the information systems. (Brook, 2019); (Cyganek et al., 2016b)

CDS (Clinical Decisions Support)

These are used within healthcare facilities to help with making a clinical decision which would be more informed, with the data available more accurate diagnosis or predictions can be made for a multitude of ailments. This can further help with the care of patients on an individual level.

The effectiveness of this is that it allows for a patient data to be linked with a database to provide information and improve the decision making of a CDS. This allows for when a diagnosis to be made a more accurate one and if there is a prescription required it will use the patient’s data for a more informed decision for the dosing of medication. Overall the CDS is extremely effective but it does have issues which can be ironed out in the future through the development of it and the errors in the CDS can cause patient harm. (Beeler et al., 2014)

# 3.Evaluate the importance of data security and quality in the Healthcare sector.

## Introductions

The data quality and security are imperative within the healthcare sector, without the two there will be issues with the treatment of patients. Quality could cause improper diagnosis or decisions which would be less informed then they should be. Security is important as all patients’ medicals records are confidential and potential leaks or flaws can put their health conditions in the eyes of other which would be a data breach leading to heavy implications on both parties.

## Data Quality

Data quality in healthcare needs to be to a high standard to make sure there is little errors within it otherwise issues will arise, making sure the data collected is of a high quality.

High data quality must be ensured to make sure that it is correct, appropriate and consistent within the patients records. Using HIS and databases this has allowed for factors such as misspelled words and unfitting fields to be minimised and removed. A study in 2014 compiled a list of data quality challenges within healthcare to find any reoccurring issues for data quality on patients. The main areas focused on to make sure data is of high quality is timeliness, amount recorded/completeness, no mistakes, relevancy. This was done using a literature survey and the conclusion is that the prioritizing data quality challenges can have an effect on the improvement on quality of data present in healthcare. (Botha et al., 2014); (Patil and Seshadri, 2014)

## Data Security

Data security is one of the foundations with patients within the healthcare sector, as all data on patients is confidential to those, they are tasked with helping them. Without these measures in place many issues can arise and cause profound effects.

The data security for patients is imperative, take that to a country wide scale and that is millions of patient’s confidential data to be secure. Cloud based storage is becoming more commonplace to store information this is because it uses pay for what you use which reduces the economical strain placed on healthcare. However, accessing cloud-based storage which would be off site using the internet has a greater risk in security and using other forms of robust security such as AES 256-bit is good. However, the longer time to decrypt it can cause issues. Other forms of security can be used to make sure the data is safe, through the means of a multi cloud-based storage system, SSS (Shamir’s Secret Sharing) can be introduced which would break the image down into skeleton/shadow images which would all be placed on a different cloud server, these images would then have a “share” which would then be collected and then when the threshold is met is will produce the original image. Without all the shares the image would not be displayed meaning if there is a cyber-attack, they would have to collectively attack all servers meaning the data security would be exponentially more robust. (Marwan et al., 2019); (Hirokuni, n.d.); (Crypto Wiki, n.d.); (Third Annual Benchmark Study on Patient Privacy & Data Security, 2012a)

# 4.Highlight any issues and identify opportunities for improvement within the Healthcare sector in relation DBMS and information systems; reference good practices in other business when Db are used to analyse data.

## Issues with Healthcare:

In healthcare big data is commonplace, using clouds which hinders conventional means of securing the data. However, there is policies and procedures in many countries which require a certain amount of protection and prevention mechanisms, such as the USA HIPAA (Health Insurance Portability and Accountability Act). A Ponemon Study show that within the last 2 years 94% of hospitals had a security breach. (Third Annual Benchmark Study on Patient Privacy & Data Security, 2012b); (Rao et al., 2015)

## Healthcare Database Use/Analytics:

Within healthcare the use of analytics is to use the gathered data to learn and help identify solutions which will benefit patients such as personalized health care, better prognosis, predications and outcomes through the use of precious data. Furthermore, potential reductions are estimated to be near $300 Billion in the U.S healthcare. Within the UK the implementation of HIT/S (Healthcare Information Technology/Systems) has been very slow, albeit the main factor being to implement this into the NHS the initial start-up cost of a new system would be very costly and the overall transition of data to it would take an incredible amount of time. However, NHS does use HIT, but it is still generally inadequate within hospitals, there are a plethora of factors affecting the implementation. There needs to be a vision of the technological change in which it would allow all the NHS organisations to seamless exchange information with each other and for the incredible amount of work to be carried out. (Palanisamy and Thirunavukarasu, 2019); (Cresswell and Sheikh, 2015); (Raghupathi and Raghupathi, 2014)

## Good practices for Databases

Normalisation of data, this will help with data redundancy by removing repeating data groups and identification of primary keys in tables.

Documentation, allows for anyone to pick up the DB and see the relationships, primary keys and other important areas such as design and rules.

Well structured, use convenient and consistent naming conventions, any shortcuts or abbreviations used to be documented clearly. (Concepta, 2018)

## Business and their use of data

Amazon, stores large amount of information on customers, however they use this information to make advertisements, but mostly they use this information to improve customer relationships which benefits their customer services, by making it an efficient process and a better experience for the customer themselves.

Starbucks, uses big data to look into the demographic of an area, average traffic, behaviour/habits of customers. This allows them to assess the potential opening of a store and how successful the store will be in terms of potential profit.

General Electric, the use information collected form sensors to calculate reliability and process, the information is analysed to make new developments increasing efficiency, which can be harnessed to lead to greater boosts in the overall productivity. (O'Neill, 2016a); (Mentionlytics, n.d., a);

## Improvements from other businesses

The healthcare sector can take note of how other business harness data through DBMS.

They could use Amazon’s example and use the information they have on patients plus questionnaires to improve their patient’s satisfaction regarding question or general services provided, booking etc. this could show an increase in efficiency and patient happiness with the facilities.

In regard to Starbucks, a facility could check the location of patients they have to get a demographic of how far patients have to travel and use records to make predictions about what the most likely cause of a visit is and have general preparations for the most likely caused visits. (O'Neill, 2016b); (Mentionlytics, n.d., b)

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