NOSQL VERSUS RELATIONAL DATABASE

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# Declaimer Declaration

The topic of this dissertation research report was confirmed by my supervisor and after the confirmation, this particular topic was allocated to me. In this dissertation report, entire information has been carried out by using a legal set of resources, and proof of the resources has been provided. In this dissertation report, the entire structure of the legal research report has been used and I do hereby declare that the entire work has been completed by me only. I have acknowledged all the basic prospects to finish this dissertation effectively.

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# Chapter One – Introduction

## Aim and Objectives:

The main purpose of this dissertation is to simplify or describe various modules and operations of an associate research title. The research of this dissertation assignment is related to the explanation of differences between NoSQL and relational databases. Realization of actual differences between both NoSQL and relational databases is the main area of research of this dissertation assignment. In real-world applications, the usability of both the databases is very important and both the databases are providing their services to implement a software solution. In any software application, the importance of backend or database management system (DBMS) is very important to integrate with the backend services (Kolonko, 2018). Both NoSQL and relational databases have their objectives, method of implementation, method of integration, advantages, disadvantages, and many more, and in this research dissertation assignment, the comparison between both the databases will be elaborated. Both the databases have their development and deployment IDE and services that will also be evaluated in this dissertation assignment. A database management system (DBMS) is software for storing and retrieving the data of the users while applying multiple security features.

There are some objectives available to analyze the comparison and differentiate the services of both NoSQL and relational databases such as:

* To analyze the advantages and disadvantages of both NoSQL and relational databases.
* To examine that how NoSQL and relational databases are different from each other.
* Evaluating the design pattern differences between NoSQL and relational databases by measuring the security component (Kolonko, 2018).
* By measuring the learning outcomes of both the databases as per their services, features, and operations.

## Problem Statement:

In every software application, the usage of the database is very must and they are providing their services into multiple segments in today’s technological world. Due to the vast usage of the internet, a huge amount of data is to be generated or posted on daily basis, and systematically managing all such datasets is highly required for handling databases for different purposes. The problem statement of this dissertation research assignment is based on the most flexible and reliable database between NoSQL and relational databases. For the business organization, this is very important to choose an appropriate database for their usage but most of them are not aware of the database selection process (Kolonko, 2018). Although between both the databases relational database is very old and quite trusted database design also but for the newly integrated application, the usability of NoSQL database is increasing effectively. In this dissertation report, the approach of database selection for organizations will also be reviewed.

## Background:

A database management system (DBMS) is nothing but a computerized data-keeping system used to store, manage and define a collection of data. This is an interface between the end-user and the database for managing the operation of data and the database engine. Database management system (DBMS) has many types such as network database management, distributed database management, hierarchical database management, relational database management system, and NoSQL database management system. The usage and operations of every database are different and have their values (Ribeiro, 2017). For every business organization, this is very important to choose an appropriate database model between SQL and NoSQL database but the selection of database is always based on the feature or operations delivered by the software application. For a business organization, the criteria of selecting an appropriate database are based on some consideration list like their usability, security, functionality, support & development, visualization & reporting, integration, update, hosting, and many more.

In any application development like software application, cloud application and many more two types of database management system commonly implemented like relational database and NoSQL database. Both the database are built differently and have a different methodology to store data along with accessibility. Between both databases, relational databases have been a prevalent technology for decades (Ribeiro, 2017). A relational database is the oldest database management system (DBMS) used by business organizations for handling data-related operations. A relational database is widely implemented which provides storage of related data tables. The table schema of a relational database is fixed which uses structured query language (SQ) and supports ACID guarantees. NoSQL database is known as a non-relational data store process and as compared to the relational database this is very ease-of-use, this is a reliable feature. NoSQL database stores unstructured or semi-structured data in JSON document format. This database structure is a document-oriented format. As compared to relational database NoSQL use commodity hardware whereas relational database uses specialized database hardware for better performance. Multiple models are available in the NoSQL database for managing and accessing data (Henrique, 2017).

## Research Questions:

For this assignment, the research question has been characterized into two parts like main research question and the research sub-question. The literature review section of this dissertation will be completely focused on the research questions identified for this research topic. The complete information of NoSQL and the relational database will be directly or indirectly related to the research questions identified or created for this assignment.

**Main Research Questions:**

* How NoSQL database is different from a relational database?
* Among NoSQL and relational databases which one is better and what are the advantages and disadvantages are there of using both databases?
* What are the design patterns of NoSQL and relational databases? Define the security measure control also.

**Research Sub-Questions:**

* Among relational and NoSQL databases which database is suitable or reliable and for what data patterns?
* What are the learning outcomes of relational and NoSQL databases?
* If the relational database is one of the most trusted databases then why there is a need for NoSQL database integration?

## Deliverables:

For this dissertation research assignment, a proposal will be delivered by containing some briefing information about the research topic that what we are going to cover, and what are the components be used for the assignment completion. Along with the dissertation proposal and final research portfolio or research assignment handbook will be submitted on the portal as a deliverable.

# Chapter Two – Research Methodology

## Data Collection:

For every research topic, this is very important to collect data from appropriate and legal resources and this data collection method is one of the most important techniques. This is a procedure to collect, analyze and measure data for a particular research topic by using the technique of standard validation. For this particular dissertation research, the data was observed from various resources like surveys, journals papers, articles, questionnaires, and many more. The entire information which is defined in this research report is completely based on the collected data resources. The method of data collection is very necessary and must during the research project because this allows us to gather and analyze the valuable material for the research by evaluating the existing and future research (Henrique, 2017). The best approach of data collection which is used for this research is survey-oriented. This survey-oriented data collection methodology allows us to ask questions to multiple business organizations (Comcast Corporation and AB BANK) to get an understanding of the most reliable database structure between NoSQL and relational. For getting a valuable understanding of the databases many questions were asked to individual developers and business managers. Apart from this, the data was also collected from some journals articles and research papers. The sources of data are listed in the references section as proof for the reader.

## Methodology:

For defining the comparison between NoSQL and relational databases the quantitative research methodology is implemented for this dissertation report. The reason for selecting this methodology as a research purpose is because of its measurable features of data. All information regarding the data is to be available in numerical values which are very easy to understand and measure (Ismaili, 2018). One of the most important features of quantitative research methodology is concept classification and this makes a numerical model for identifying the complete reliable information of the research topic. For the software development applications, both NoSQL and relational databases are very important to integrate directly with data-related activities and to handle them easily. For this research topic observation technique is used and due to this feature, the experimental data analysis method is also integrated for getting complete insight about the topic. The main objective of using experimental data analysis is to conclude the legal resources and legal information for an appropriate data approach to collect the treasured evidence (Ismaili, 2018).

The quantitative research methodology allows us to sample data in both structured and unstructured form which is very useful for comparing the object of both data approaches. As stated survey data approach is used as a data collection methodology for this research which allows us to collect information from various business persons and developers about the usability of the NoSQL database and relational database. Some applicants were involved in describing the features of both relational and NoSQL databases as per their usages, features, operations, method of implementation, method of deployment, and many more. This questionnaire approach allows us to get deep knowledge about the database functioning in business organizations. By using this approach we can get more involved with the research for defining the best knowledge (Ismaili, 2018). Because both relational and NoSQL databases are having their advantages, disadvantages, functions, and operations which is very important to understand an expert’s vision. The outcome of the research can be generalized in a manner to define the approach of data collected from the various resources and responses from the business persons and individual developers. The evolution of relational databases is very high as compared to NoSQL databases. In most business organizations, the relational database management system is one of the widest databases which is providing their services to the particular business process. Both structured and unstructured data integrating approach is integrated into this quantitative research methodology for defining the purpose of this research report. By using this research methodology all such possible components and comparison between NoSQL and relational databases (Majeed, 2019).

# Chapter Three – Literature Review

## Differentiation between Relational & NoSQL Database:

SQL databases are known as relational databases and relational databases have table-based data structures for handling data-related activities. NoSQL database is known as a non-relational database and this type of database is to be based on a document-oriented pattern by including the services of the graph database, wide-column storing, and many more. The development of a relational database is to be associated with the relational model by having the data storing ability in a row and columns (Majeed, 2019). The entire information of the data object is to be behold in the relational database table for representing the database management activity. For the NoSQL database management system, there is no requirement of any pre-defined schema as a relational database. NoSQL database allows us to use or integrate unstructured data easily. The relational database is very expensive and for every business organization, this is quite difficult to implement the services of this database for their usage. NoSQL database is very cost-effective which is provides the services of a cloud database implementation, integration, and deployment also (Majeed, 2019).

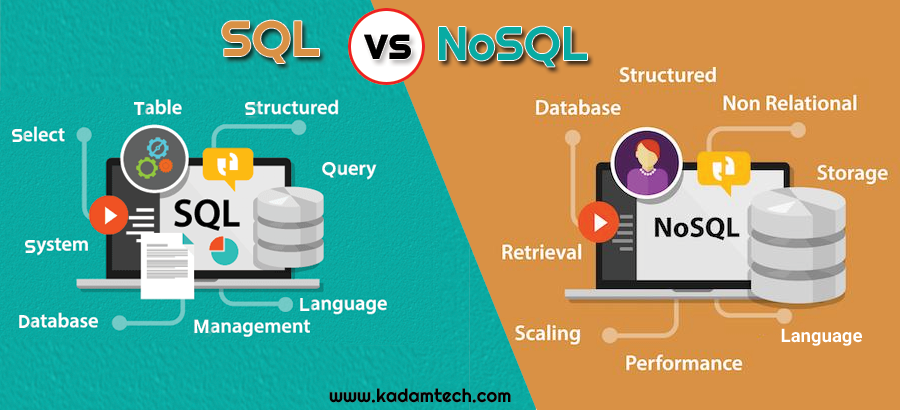


Figure 1: SQL & NoSQL Database

The performance of a NoSQL database is very high as compared to the relational database because a non-relational database is having the functionality of scalability, availability, integrity, and many more. A relational database provides an ACID guarantee but a NoSQL database does not provide an ACID guarantee. Numerous functions are available of SQL (relational database) like:

* Database retrieval
* Perform queries on database
* Update record in a database
* Set permission on a database table
* Create a new database and new table in the database structure
* Delete records in a database
* Creating store procedure for databases (Mihai, 2020)

Key Features of NoSQL and SQL:

|  |  |
| --- | --- |
| Features of SQL | Features of NoSQL |
| A relational database provides high-performance capability. | The scalability of NoSQL database is very high as compared to other database management systems (DBMS) |
| Many different kinds of databases (RDBMS) are compatible with SQL like SQL Server, MySQL, Oracle database, MS Access, and many more. | There is no requirement of any pre-defined scheme in a NoSQL database and the database developer can work in an unstructured database freely (Mihai, 2020). |
| One of the most important features of an SQL database is its data consistency because of the availability of ACID property with a strict schema. | Before storing the data into the database there is no requirement of defining any schema. |
| The approach of vertical data scalability is available in the SQL database. | The distribution of data on more than just one device is too available in the NoSQL database management system. |
| The relational database is capable of handling large transactions. | For storing solutions of the database activities there is no requirement of any specialized hardware infrastructure. |
| The implementation of a relational database is suitable for every kind of business organization like small and large. | The concept of data normalization is not required in a NoSQL database management system. |
| The supportability of open source programming language is there in a relational database. | For implementing the database activity for user interface designs there are many simple application package interfaces (APIs) are available in the NoSQL database. |
| This database management system is very easy to learn and implement. The relational database supports data definition language (DDL) and data manipulation language (DML) also for performing multiple types of queries in the database. | The non-relational (NoSQL) database can store structured, semi-structured, and unstructured types of data easily (Mihai, 2020). |

Table 1: Features of SQL and NoSQL

In a database management system (DBMS) different types of SQL databases are available such as:

* MySQL
* Oracle Database
* Microsoft SQL Server
* PostgreSQL
* DB2, etc.

In a database management system (DBMS) different types of NoSQL databases are available such as:

* MongoDB
* COUCH DB
* REDIS
* Cassandra, etc.

In a NoSQL database management system the data can be stored into multiple data storage formats like document stores, graph databases, key-value data stores, column-family data stores, and many more. Accessibility of both NoSQL and SQL databases is easy as per their usage and way of operations but the functionalities of both the databases are different for their purpose in a business organization (Dabowsa, 2021). For the business organization, this is very important to understand their needs for implementing which kind of database for which purpose. In SQL database management system ACID (atomic, consistent, isolation, and durable) is known as database property. For successfully making a transaction there is a need to implement the ACID property of the relational database. As compared to relational databases the NoSQL database provides one of the most flexible data requirements which is very easy to implement and understand. Nowadays most business organizations are using the functionality and operations of NoSQL databases because this can handle flexible data storage and has a static data structure also. The NoSQL database provides the functionality handling every-changing data model also to make the database management system more ideal and real (Dabowsa, 2021).

The availability of database integration in the real world has become very important on a big scale because every business is now running online like healthcare business, insurance business, investment business, education business, and many more. Due to this the huge amount of data is used to be generated on daily basis and to manage all such kinds of data they need of a decent database management system (DBMS) software tool is highly required. In real-world applications, the availability and integration of both NoSQL and SQL databases are very important because the requirements and operations of both databases are quite different and have their values concerning the database integration model. Every business process requires to be different from each other and this is the responsibility of the business persons, managers, and developers of that particular business organization to understand their actual database management requirements effectively so that they can choose an appropriate and actual database management system for their purpose (Aldiabat, 2018). The NoSQL database system can use the low-level programming and query language easily which has a unique method of data implementation and a different approach to handling database activity. On the other hand relational database is having their old methods and predefined objectives for managing the database activity for every large and small scale business organization.

## Advantages & Trials of NoSQL and SQL Database:

**Advantages of SQL & NoSQL Database:**

|  |  |
| --- | --- |
| SQL | NoSQL |
| One of the most important advantages of using a relational database is that this is having a security feature. The number of data tables can be associated with each other in the SQL database and the data of some of the tables use to be very confidential also. By using the SQL database management system the table of the databases can be protected by using the password protection feature. For getting an authorized user accessibility this password protection feature is an advantage of the SQL database. | Nowadays the software development operations are moving to online portals and NoSQL database management is becoming the first choice. The concept of horizontal data scaling functionality is available in the NoSQL database which helps to reduce the complexity of data handling. NoSQL database can integrate the high application servers also to enhance the data management ability. |
| Accessibility is one of the most important advantages of SQL databases. By using this DBMS the database developer does not require any specific location for accessing the data. The process of updating data, adding data is very easy in an SQL database management system. This accessibility feature of the SQL database provides outcomes for a particular user only (Aldiabat, 2018). | Big data operations can easily be performed by using the NoSQL database management system. Big data nowadays is one of the most widely used database structures for handling a high volume of data. The rate of transaction in the NoSQL database management system is very fast which directly creates the particle management component. |
| The speed of data processing in a relational database management system is very fast although the performance is quite low as compared to speed. The SQL database management system provides the functionality of data optimization and due to this data optimization functionality, the speed of data processing is very fast in this database operation. | The operation of server management can easily be performed by using the functionality of the NoSQL management system. The infrastructure cost of the NoSQL database management system is very cheap as compared to other database management systems. Along with infrastructure costs, the integration cost is also cheaper. |
| By comparing to other database structures the relational database is very simple and provides the ability to perform multiple queries easily on database structures. The integration of any complex query can easily take place by using the structure of the relational database. For handling the data-related approach many options are there to perform the valuable data-related activity. | NoSQL database management system provides the facility of flexible data models and the change management feature is also to be provided that permits to change the data model. Most business organizations are nowadays using this database because they can easily relocate the data type at any time while working on database structure (Aldiabat, 2018). |
| The operation of data accuracy is very effective or efficient in relational databases by providing the services of primary key and foreign key integration for the database management system in a table-oriented form. The operation of non-repetitive data is also available in the relational database function that provides a more accurate feature for the data process. The functionality of a multi-user database management system is to be provided in the relational database management system and more than one user can be associated with one database structure. | The NoSQL database has many inbuilt database library features like organization sale system integration, inventory management system, integration of web services, and many more. The entire activity of web server implementation is one of the most important features of a NoSQL database management system. |

Table 2: Advantages of SQL & NoSQL Database

**Trials of SQL & NoSQL Database:**

|  |  |
| --- | --- |
| SQL | NoSQL |
| The costing or cost architecture for performing the database operation is very expensive in the relational database management system. In SQL database management for any kind of additional upgrader and infrastructure, the additional charges are there which are also very expensive as compared to the NoSQL database management system. Along with the charges the maintenance of the database system is very expensive and requires an expert individual for handling all the activities. | The challenges of database support are available in the non-relational database management system. For the business organization, this is very important to get instant support on data-related problems but a non-relational database does not provide an instant solution for data activities as compared to the relational database. Due to the open-source project service risk factor is very high in the NoSQL database management system. |
| One of the biggest challenges of SQL databases is information loss. During the period of a large amount of data processing steps sometimes the issue of information loss occurs which directly affects the process of data processing on the application module. The reason for information loss can be anything and sometimes this is also very difficult to find out the actual problem of data loss. | One of the biggest challenges of the NoSQL database is that this database is not having a wide history as compared to the SQL database system. The functionality of database scalability, integration, and many more are there but still, they are not well defined for handling all kinds of difficulties during the database implementation phase (Patra, 2021). |
| For performing the database activities efficiently the relational database requires a huge amount of physical storage which may lead to super expensive. The functionality of data optimization is missing in the SQL database management system and due to this issue, the deployment phase of the SQL database used to be very low. | Many technical challenges are also available in NoSQL databases management systems such as application-consistent backups, de-duplication for NoSQL databases, performance, scalability, data integrity, data management services, and many more. |
| The building of data retrieval and processing is very complex in the SQL database management system. Sometimes the integration of data with the particular data tables becomes so complex if a huge amount of data is available in the database structure. This is one of the biggest problems faced by many business organizations while working on relational database management systems. | For the NoSQL database management system, the business intelligence is one of the biggest challenges because for this latest technology module the demand for the data version always increases constantly, and for the NoSQL database management system this is very difficult to fulfill requirements based on the version of an application feature (Patra, 2021). Administration designing is also a kind of challenge in the NoSQL database management system which is affecting the business because a zero-admin solution is to be provided in the software design process in the NoSQL database management system which may lead to an irregularity in the database integration process. |

Table 3: Trials of SQL & NoSQL Database

## Design Patterns:

Design patterns are time-tested solution templates which is not a complete and finished design and not a plug-in class also. This is a description of a solution that we can read and for a database design management system, a structured approach is to be used for the development process. Database design patterns have elements of reusable object-oriented software like ERIC GAMMA and many more. In database management system design patterns use to solve multiple issues by using a proven solution. This is used to isolate the irregularity in the system requirements and design pattern is used to make the overall system easier to understand the entire working functionality (Patra, 2021). For making communication strong between application designers and developers the design pattern is one of the most important features that are to be used in the database management system (DBMS).

The functionality of micro-patterns are available in design pattern which is used to break down design patterns into recognizable chunks and multiple features are to be designed in the database applications. Design pattern in the database has numerous values like pattern name, motivation, intent, structure, applicability, participants, and many more. The design pattern documentation also has numerous approaches like data dictionaries, naming conventions, design documents, and many more. Database design patterns have many segments such as:

* Data Mapper
* Lazy Load (Patra, 2021)
* Identity Map
* Domain Object Assembler
* Unit of Work
* Identity Object

The concept of internal and external documentation has an impact on a database design pattern that provides a unique valuable outcome of the database management functionality. Internal documentation has numerous features such as:

* This is used to execute internal working of the system
* Internal documentation used to ensure the results match design documents
* The internal documentation is used to support the maintenance of other documentation
* This used to guide maintenance towards the documentation process (Raju, 2021)

The external documentation has the functionality of system usage and support purchase feature for the implementation decisions. To provide the development team incentive the external documentation is very important in database design patterns. Online transaction processing (OLTP) and online analytical processing (OLAP) are some of the most important design patterns that have an impact on the database design pattern. Relational database design has one-to-many relationships by using a foreign key. The integration of a many-to-many relationship with a bridge table is one of the most important features (Raju, 2021). For the business organization, this is very important to integrate design patterns for implementing their functionalities effectively. Both NoSQL and relational database management system has their design patterns. Architecture pattern is known as NoSQL database design pattern which is to be categorized into the database section storage. This architecture pattern has many different features such as key-value store database, document database, column-store database, graph database, and many more. The anti-patterns have several methodology components in the database design pattern that has the values for managing the data-related activities. For avoiding the identity of numerous different approaches the database design patterns are to be used in both NoSQL and SQL design patterns (Raju, 2021).

## Learning Outcomes:

The functionality of the closes and open source feature is available in both relational and NoSQL database management systems. The SQL database management system has the integrity of an open-source platform and an example of a relational open-source platform is the oracle database. The reason for being an open-source platform for oracle is that this database can easily be integrated with other database management systems like MySQL and many more. In the non-relational (NoSQL) database management there are many kinds of databases are available who are having the functionality of open sources features such as MongoDB, Couch DB, and many more. The concept of high data scalability is available in non-relational database management systems which is providing an opportunity to numerous business organizations to use the services of NoSQL database management systems (Ribeiro, 2017). Both the databases NoSQL and SQL is having different costing architectures. The costing of a relational database is very expensive whereas the costing of the non-relational database is quite cheaper as compared to a relational. Although the services provided by both the databases are the same but still there is a huge difference between the costing architecture of both the databases. NoSQL database management system is an open-source software system which is having the functionality of a cheaper or compared database system and this database system provides the functionality of virtual machine development also.

Both relational and non-relational databases are having the functionality of scalability but the way of implementing scalability-oriented features is quite different in each other. In both databases system, the importance of scalability has an impact because for providing highly-oriented maintenance service to the database structure the scalability is required. In the relational database management system, the approach of hardware upgrader is also available but this also contains some issues that may affect the database development feature (Ribeiro, 2017). Among both the databases NoSQL database provides high scalability because this database module uses a commodity server and by using the functionality of this server the operation capacity can be increased effectively. Nowadays for most business organizations, the NoSQL database has become the first preference due to all such important valuable features and operations. The server integration process may be complete in a very short time where a relational database is taken lots of time to develop or implement the server-based coding architecture. The way of database implementation functionality in both the databases are very different but eventually, their learning outcomes are the same for the users (Pessoa, 2022).

# Chapter Four – Critical Evaluation

## Product/Topic:

The main purpose of doing this assignment is to get complete information about the differences between the NoSQL (non-relational) database and SQL (relational) database. The main purpose of this dissertation assignment is to evaluate different components available in both relational database and non-relational database for the real world application. The implementation of database management system (DBMS) has become one of the most important approaches and nowadays in every business field the implementation of an effective database structure is highly required (Pessoa, 2022). Database management system (DBMS) has two types of structured relational database structure and non-relational database structure. The operation of both the databases are different from each other but eventually the main objective of implementing the database is same for both the databases. The reason of selecting this topic because the usability of internet technology is increasing in all over the world and this is the reason the data is becoming very important. Huge amount of data is to be generated on daily basis in all over the world and to manage all such huge amount of data, this is very important to have a database structure. The data on the internet can be in any format like text, video, audio and many more. Both the databases NoSQL and relational databases are very important for handling data-related activity in real world application. Both the databases are having the functionality of scalability, reliability, compatibility but in a different manner and in a different segment (Hillenbrand, 2020).

Because this topic is a technical-oriented topic, there is a huge amount of data or information are available on different platforms to completely define the process and operations of NoSQL and SQL database management system. For effectively evaluate the complete research purpose a systematic approach has been used in this dissertation research report. The initial step was related to collecting a legal and actual resource of data from various different portals so that the complete information about the NoSQL and SQL database can be define in this research report. The data for this assignment was collected from various different resources like articles, journals papers and many more. The survey-based data collection method has been used as a primary source of data for this assignment. After collecting data the next step was to implement an effective research methodology to complete the entire research. For this assignment quantitative research methodology has been used (Hillenbrand, 2020).

## Process:

A serialization process was used in this dissertation assignment for completing the assignment effectively. The main purpose of using the sterilization process because in a dissertation report there is a pre-defined structure for explaining all the things in a serial manner. The topic of this assignment was associated to the differentiation between NoSQL and SQL database management system by defining their way of operations, methodologies, functionalities and many more. For evaluating the complete purpose of this research the structure of dissertation report has been followed effectively and a complete report investigation phase was used for getting the outline ready.

* The complete background of the research was analyzed before initiating the research development phase (Hillenbrand, 2020).
* The complete information of the research topic was carried out by utilizing the methods of data collection. The approach of data collection was one of the most important features to get accurate information on the research topic.
* A proper research methodology was used to get the complete insight information of the research topic and for this quantitative research methodology was used because this research methodology can analyze and collect structural and numerical data also.

The listed steps were used in this dissertation assignment for getting and appropriately defining the information. Each step listed in the above bullet points was successfully carried out by evaluating multiple knowledge in this research report. In the first step the complete background research was done on this given research topic and by doing this analysis work the deep insight information about the NoSQL and SQL was collected. Multiple factors were analyzed like how NoSQL and SQL are different from each other, what are the basic features or functionalities are to be used by both the databases, what are the design pattern of both the databases and many more (Abubakar, 2020). The next step of this dissertation assignment was to implement a data collection methodology so that the legalized data or accurate data related to the dissertation topic can be collected. A survey-based data collection method was used as a primary data collection for this assignment. Along with this many other resources were also used by which the complete literature review part of this assignment was done. All such realized process that has been used during this dissertation research are very important and provided an important impact on the entire research report.

## Reflection:

My main purpose of doing this assignment is get the valuable information about the database management system (DBMS) that how database management system (DBMS) has an importance in the real world applications. The topic of this dissertation assignment was to compare the relational database management system and non-relational database management system by evaluating their importance, features, operations, challenges, advantages and many more. The importance of both the databases in the application management and business operation management is very important and I have learned many new things during working on this assignment. I was motivated towards the technology-oriented platforms and this topic was quite very interesting as per my field of interest. By analyzing the research topic I got to know that the business organization is using both NoSQL and SQL database management systems as per their requirements (Abubakar, 2020).

To explain the complete information effectively for this research topic I decided to collect the data from different resources for describing the comparison between both the databases effectively. I decided to implement a data collection methodology to collect the data for the particular research topic and my primary method was to collect data by doing a survey-based approach from some business persons and managers of business organizations. Along with this, I have collected data from other resources also like articles, papers, journals, research papers, and many more. The main purpose of data collection methodology is to collect the data of the research topic so that I can explain the entire information required for the research to list. Along with the data collection methodology I have utilized the services of research methodology and for the research methodology, I used quantitative research methodology (Abubakar, 2020). The reason for selecting quantitative research as a research methodology is because this methodology allows us to get numerical data that is very easy to collect and analyze also to define the research topic most effectively. I was continuously trying to collect a huge amount of data so that I can have a sufficient amount of information as per the desired research question. The complete information which is defined in this research report is completely based on the research questions.

By doing this assignment I have learn many things about database management system (DBMS) that how this is impacting the business organization and real-world applications also. For defining the entire information for NoSQL and SQL database management system I have properly used the content resources collected by me for this dissertation research report (Modhiya, 2021). I have conducted surveys also to get the insight information properly based on the research topic. The questions were asked to dedicated business organization’s manager and developers that what thinking they have about the usability of the database management system (DBMS) between NoSQL and relational database. I collected survey results from Comcast Corporation and AB BANK like:

|  |
| --- |
| **Question:**  What is the process of database selection between NoSQL and SQL? |
| **Answer (Reaction by the executive of Comcast Corporation):**  This is something which is always an important phase for us. Both the databases are valuable in their own space and there is nothing we can neglect between NoSQL and SQL. But we as an organization always think to use that database which can be implemented easily and cost-effectively also but sometimes this theory does not work for us due to the requirements of our client and application. The main thing that we always look at is the requirement of the software and client if the requirement of both software and client can be done properly by only specific one DB version then we go further other we choose an alternate option. |

|  |
| --- |
| **Question:**  How NoSQL database is competing with the oldest relational database management system? |
| **Answer (Reaction by the executive of AB BANK):**  If we compared NoSQL database with relational database then this is known that NoSQL database is having a very quick development lifecycle for the application developers which provides an integrated path for the developers to develop applications effectively. Many different analytical tools are also supported by the NoSQL database management system because this database can work with big data also. |

During this dissertation assignment I was enjoying working on this because the topic of this assignment was based on the technical-oriented and I fond of technology which inspire me to research a lot about the research topic. The research topic was very deep and there was a huge amount of information available on the internet and many other resources. By doing this assignment I have learn many new approaches used by the business organization for implementing the database management system (Modhiya, 2021). I understood the concept of working database management functionality to implement both NoSQL and relational databases. As per the data I collected and methodology which I used, I have successfully described all possible information of the differences between SQL and NoSQL database management system. The entire information which has been defined by me in this assignment report is completely correct and legal. I have discussed everything about the differences between both the databases and their architectures. Only valuable information has been described in this report not ordinary. The reader of this report will find the entire report very valuable and impressive because the main factors like importance of NoSQL & SQL, their design patterns, advantages & disadvantages, choice of selections and many more has been defined clearly. For this I have compared the data from various other articles that helped me a lot to get the complete insight information for the research topic (Modhiya, 2021).

## Influencing Factors:

Well, this topic is quite something which is quite known for me and I was very much involved into this dissertation research because I have a huge interest in the software development field which helped me a lot to do very well for this dissertation research assignment. The knowledge of database management system (DBMS) was applied by me earlier in my previous projects and that particular knowledge and learning experiences inspired me to take this topic as my research assignment. Along with my personal learning activities, my approach towards learning something new was very influencing factor for me. I am a kind of person who always ready to learn something new and having a huge interest in the technical field was a bonus chance for me to better in this dissertation research assignment. One of the most influencing factor was also my decision-making approach towards the research title and research report. My decision for completing the assignment by using a particular serial process helped me to get the information effectively for this research topic.

Although the entire process was not so easy also because my knowledge of database management was not so excellent to fulfill the requirement of this research. For this I have collected data from various different sources like research articles, research papers, journals and many more. I was very particular during choosing a particular research resource because the complete assignment was based on choosing an accurate and legal resource based on the research topic. NoSQL and SQL database management is very big topic and there are huge amount of information are available on many different portals. I have utilized the entire collected resource effectively for explanting the thing very clearly. I was getting knowledge of new learning outcomes of both the database management functionality and this factor influence me because by doing this assignment I was increasing my knowledge also that was very helpful for me to do something better. I was always looking forward to keeping the data very clear and accurate so that only valuable information can be provided to the reader of this research report. In this dissertation report all the information was collected only by me by multiple resources and for a proof I’ve provided the links of all different resources in the reference section so that and everything is citied properly also. The complete tactics of the research report definition was also followed in this research report so that the standard format can be used (Radoev, 2017).

## Learnings:

If I talk about my learnings from this assignment then, I would definitely say that I have learned many new concepts about implementing relational database management system and non-relational database management system. The implementation of non-relational database and relational database is very important for business organization and in application development also. The entire research report was based on the usability of both the databases features like their operations, functionalities, features and many more. The thing which was very important while working is the justified manner of data representation. By during the data collection process I have learned about the approaches used by both NoSQL and SQL database management system. The activity of data management is very complex and to evaluate the activity in appropriate manner was very important for me and I am glad that I have delivered the things effectively (Radoev, 2017). I got to know about the ACID property of relational database management system and I have understood that how relational database management system works with the real-time data operation. The ACID property of relational database is very important for successfully doing the high amount of transaction. If I talk about storage capacity then NoSQL database management system is having high storage capacity as compared to relational database. I have learned that there is something unique in each database structure for their way of operation which use to provide valuable outcome and result for the business organization.

I observed that the internal and externa factors of both NoSQL database and SQL database are quite different because both the databases has their own values and structure which may be very valuable for the operations performed for the business organization. All such learning which I got to know while working in this assignment will be very helpful for my near future because not only practical knowledge but theoretical knowledge is also very important for understanding the things very quickly. There is no doubt that I have explained all the information very well but that can be much better also (Radoev, 2017). While working in this project I was very confident because I was quite aware about the topic and yes the experience of this dissertation research has taught me very new things and changed my approach also. In this dissertation assignment I have just focused only on specific information that was asked in this research to do and only key elements of both NoSQL and SQL databases has been defined in this research report by me.

In the database management system there are many different types of data available such as text, audio, video and many more. Both the databases support each kind of data objects while implementing them. Over the internet nowadays huge amount of data is to be generated and handled by the database structures but if talking about relational database then this database is not able to handle such huge amount of data and on the other hand non-relational database is able to handle such huge amount of data effectively. Data-intensive functionality is to be provided by NoSQL database management system which is one of the most important feature of non-relational database model. The performance of both the database are good according to their way of implementation and many more but by comparing NoSQL with relational database, the performance of relational database is not so good. The database integration of NoSQL is to be conducted by some common database management system which provides an additional functionality (Radoev, 2017).

# Chapter Five – Conclusion

The purpose of this dissertation was to explain the comparison between NoSQL and SQL database management system. The complete assignment is based on the evaluation of multiple features of relational database and non-relational database that are helpful for many other business organization and for software development application also. In application management system the implementation of database is very required and nowadays in almost business sector the database management system and their operations are increasing and both NoSQL and SQL has their own significance. The purpose of database management system (DBMS) is to store and retrieve the database for an associated user and for this there are multiple operations are to be performed in the database structure. Relational database is having a pre-defined data structure and all such information or data is to be stored in a table format. On the other hand NoSQL database management does not require any pre-defined data structure and this use document-oriented (JSON) for keeping or storing the data. The NoSQL database can work on structured, unstructured and semi-structured database structure. Relational database is having many different types such as MySQL, SQL server and many more. NoSQL has MongoDB, COUCHDB and many more.

In this assignment I have evaluated different segments of both NoSQL and SQL database for their usages. The literature review of this assignment was completely based on the research questions defined in the research proposal of this assignment. The purpose of this research questions of this assignment is to evaluate the advantages & disadvantages of both NoSQL and SQL databases, design patterns of both the databases, scalability of both the databases and many more. In this research report complete information about the NoSQL and SQL database management system has been successfully defined and every possible headings have been evaluate completely in an effective manner. Quantitative research methodology has been used for this dissertation research and along with this data collection methodology also used for collecting the accurate resources of the research report.

**Future Research:**

In near future the implementation of NoSQL (non-relational) database management system will be used in business sector because the data economy of NoSQL database management system is having many different functionalities like information technology (IT) integrated software management, machine learning approach, artificial intelligence (AI) integrated software application and many more. This will involve high scalability functionalities in future application and in almost every high technology-oriented software. Many new technologies and functionalities will be very helpful in NoSQL database management system like XEROUND and many more.

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# Appendices

## Appendix A:

In this dissertation assignment all such information about the comparison between NoSQL and SQL database management system has been defined and for making this report the information has been carried out from many resource like articles, research papers and many more and the resources are provided in the previous references section.

## Appendix B:



## Appendix C:

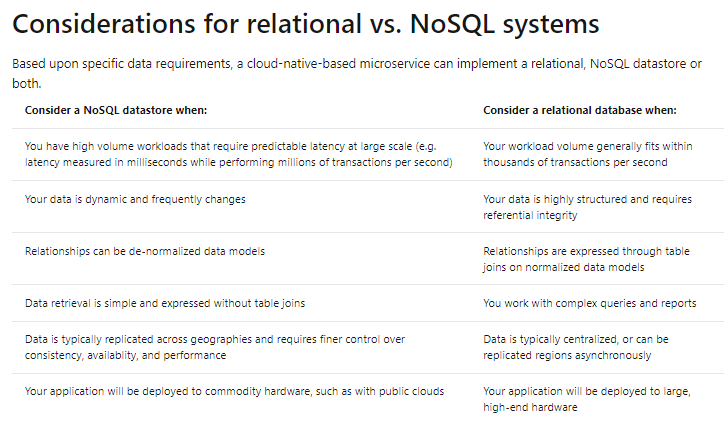


Figure 2: Appendix