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Comparison of MySQL Workbench Database Performance with MongoDB on Zoo Database

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Abstract: In general, database is stored in the form of relational model, which is known as an SQL database. However, development is always done to get a better efficiency and NoSQL databases are created which nowadays are slowly rising in popularity. NoSQL databases is non-relational database systems which are said to be faster. Therefore, this research was conducted to compare MySQL workbench which is a tool for SQL databases and MongoDB which is a tool for NoSQL databases. The comparisons are GUI, CRUD, Type, and Query Performance. The method used is experiment by trying these two tools and making comparisons. According to test and analysis results, MongoDB shows better results where MongoDB compass looks more modern, interactive, and easy to look at. In terms of CRUD comparison, MongoDB doesn't need to define the schema and supports data complexity And In terms of query performance, MongoDB can execute queries much faster than using MySQL Workbench. It is proven that MongoDB has a better efficiency than MySQL Workbench.

Keywords: SQL; NoSQL; MySQL Workbench; MongoDB

1. Introduction

Database, is a collection of related data organized in such manner way to allow easily access, manage, and maintenance by side of authorized users [1]. In general database systems are used for data storage based on the relational model. These are widely known as SQL database named after the language they were queried by. In the last few years, however, non-relational databases have dramatically risen in popularity. These databases are commonly known as NoSQL databases, clearly marking them different from SQL databases. Most of these are based on storing simple key-value pairs on the premise that simplicity leads to speed.

MySQL Workbench is a visual application tool used to manage databases. This application tool is commonly used by a database architect, database developer, and database administrator. MySQL Workbench provides comprehensive data modeling, SQL development, and administration tools

for database server configuration, user administration, and much more. Research on Performance Analysis of Neo4j and MySQL Databases using Public Policies Decision Making Data conducted by Rahmatian J.S. et al., concluded that MySQL and Neo4j performance in terms of memory usage and execution time using data public policies decision making by the Deputies. The result is in general, the execution time and memory usage increase as the number of records increases. Then, MySQL query execution time is faster than Neo4j, however both these databases have the same time complexity [2].

MongoDB is an open-source document-oriented database written in C++ that uses JSON, which is used in a schema that require less data model [3]. MongoDB also provides a simple framework for performing map/reduce or aggregation operation across multiple computers. This leads to lessons around projection of objects and basic aggregation primitives [4]. MongoDB is a type of NoSQL database, which is schema-independent, they are designed to work in harmony with unstructured data. It should be easily distributed with high scalability and availability [5]. MongoDB puts security of data and resistance to malicious attacks at the top of its priorities [6]. It will be performed well specifically in case of large number of records [7].

The focus of our paper is to compare MongoDB and MySQL Workbench on zoo databases. When NoSQL databases are generally designed for optimized key-value storage, while SQL databases are not. However, our findings show that not all NoSQL databases evolve better than SQL database. We compare read, write, delete, and instance operations on key-value stores. We observe it even inside NoSQL databases exist a wide variation in performance from this operation. We also observed a slight correlation between performance and the data model each database uses.

2. Related Works

Related research that we have found is research conducted by Vian Ardiyansyah, Setiawan Budiman, and Faisal Fadhila. In this study, we analyzed the speed comparison on the MySQL and MongoDB database systems for the SELECT, UPDATE, and DELETE commands on data with a maximum amount of 1,000,000 data lines. The applications used to perform query commands are MySQL Workbench 8.0.22 and Robo 3T 1.4.2 which are run on Windows 10 and Ubuntu Desktop 20.04 operating systems. The results of this research show that all data query processes over 50,000 rows using MongoDB are faster than MySQL. The Ubuntu Desktop 20.04 operating system produces better speed compared to using Windows 10 for both the MySQL or MongoDB database systems [8].

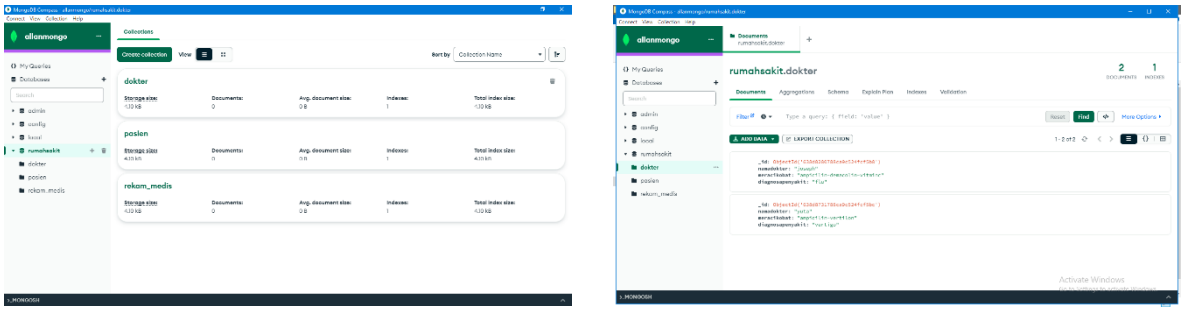
The second related research that we have found is research conducted by Mesri Silalahi and Didi Wahyudi. In this research examines the performance comparison between NoSQL database (MongoDB) and SQL database (MySQL) for web-based multimedia file storage applications that store files as BLOBs. Performance comparisons are based on execution speed and computer resource (CPU, memory, and virtual memory) usage. The results of this study indicate that web-based Multimedia File Applications designed using PHP with MongoDB database and MySQL database can run effectively and efficiently [9].

The third related research that we have found is research conducted by April Junaidi, In this study examined the response time performance on MySQL and MongoDB database. The author uses PHP scripts to process queries to get results. The results of this study indicate that MongoDB shows good performance compared to MySQL [10].

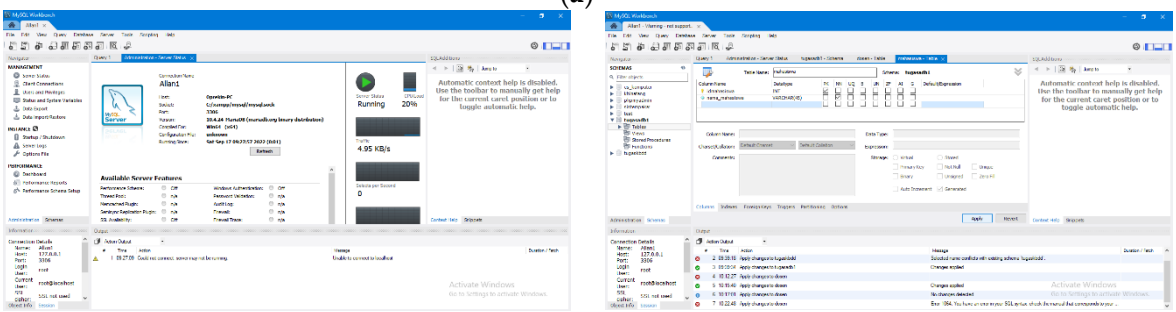
3. Experiment and Analysis

3.1. GUI

The database GUI (Graphical Unit Interface) makes it easy for users to manage databases and can be fully controlled with an easy-to-understand interface without having to use the command line. The following shows the home between the MongoDB Compass and MySQL Workbench databases.



(**a**)



(b)

Figure 1 GUI comparison. (a) GUI MySQL Workbench; (b) GUI MongoDB.

Based on figures (1), a comparison is obtained between the GUI MongoDB Compass and MySQL Workbench.

Table 1 GUI Comparison between MySQL Workbench and MongoDB Compass

	MySQL Workbench	**MongoDB**
Impressions and Experiences	Comfortable and conventional	More comfortable and more modern
Interaction and Intuitive	More structured designs of screens, buttons, icons, images, and text	More interactive designs of screens, buttons, icons, images, and text
Branding Quality	Yes	Yes
Clear Brief	Fulfill	Fulfill
Responsive	Fulfill	Fulfill
Structured Information	Fulfill	Fulfill
Consistent	Consistent for structured processing and medium to large volumes	Consistent for processing unstructured data and large volumes
Color Contrast	Monochrome	Pleasant

It can be concluded that each has advantages and disadvantages and is adjusted to the purpose of using the respective database. If MongoDB databases are interactive because they aim to display

diverse and unstructured data, while MySQL Workbench is for adjusting structured data processing and having entity relationships.

3.2. CRUD Comparison

There are important differences between MongoDB and MySQL Workbench. First, in MySQL Workbench, the data represent in tables and rows, but in MongoDB the data represent as JSON documents. In MySQL Workbench need to define the schema before input the data and can't change the schema, in MongoDB doesn't need to define the schema and there are no restrictions in schema design. MySQL Workbench supports JOIN Operations while MongoDB can't support JOIN Operations. MySQL Workbench can't support rich data model, dynamic schema, data locality, and auto-sharding while MongoDB supports it all. There are differences based on terminology.

Table 2 Terminology Comparison between MySQL Workbench and MongoDB

MySQL Workbench	MongoDB
Table	Collection
Row	Document
Column	Field
Joins	Embedded documents, linking

Create comparison between MySQL Workbench and MongoDB.

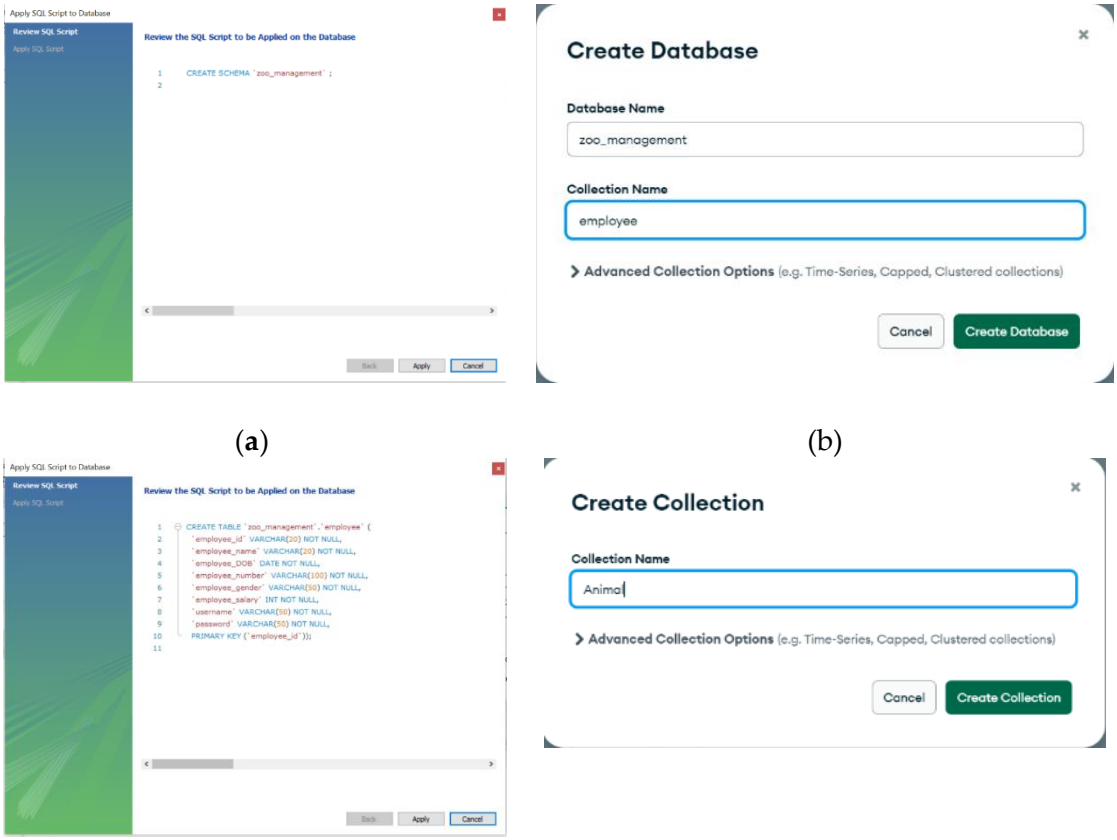
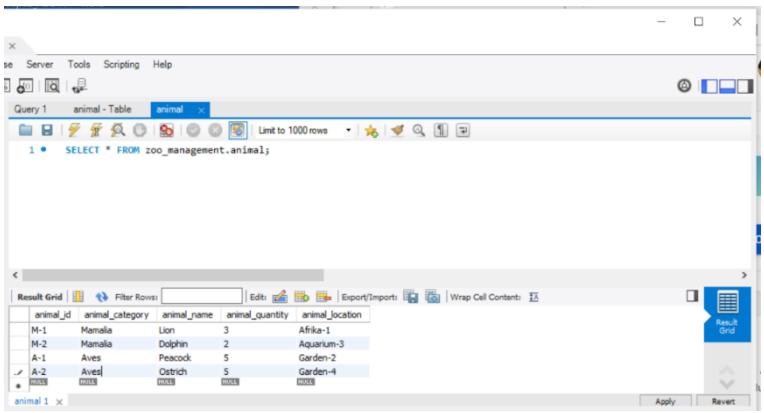
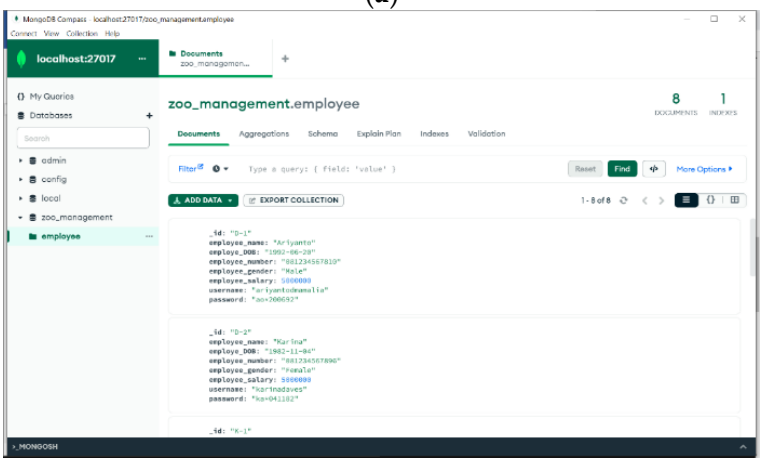


Figure 2 Create comparison. (a) Create schema in MySQL Workbench; (b) Create database in MongoDB; (c) Create table in MySQL Workbench; (d) Create collection in MongoDB.

Read comparison between MySQL Workbench and MongoDB.



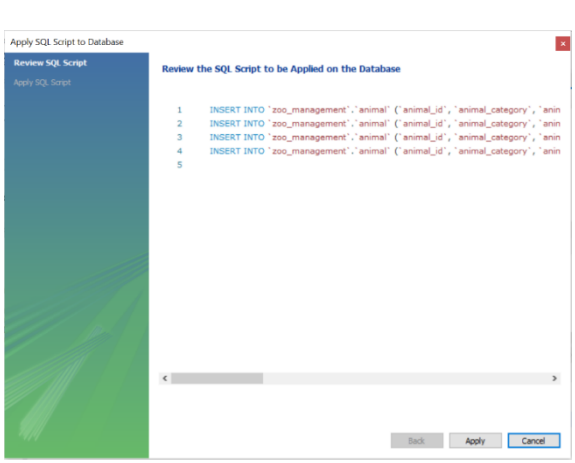
(**a**)

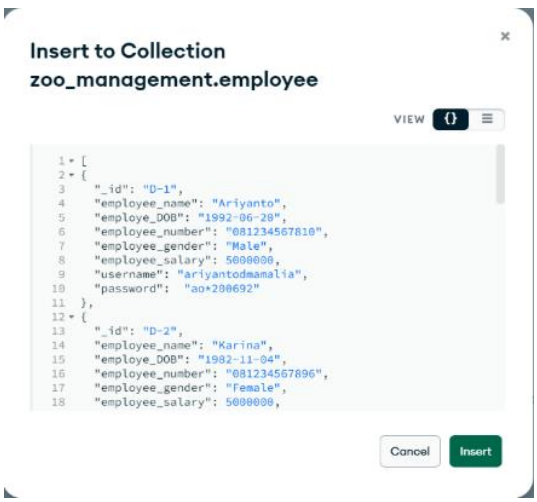


(b)

Figure 3 Read comparison. (a) Read table in MySQL Workbench; (b) Read collection in MongoDB.

Update insert data comparison between MySQL Workbench and MongoDB.

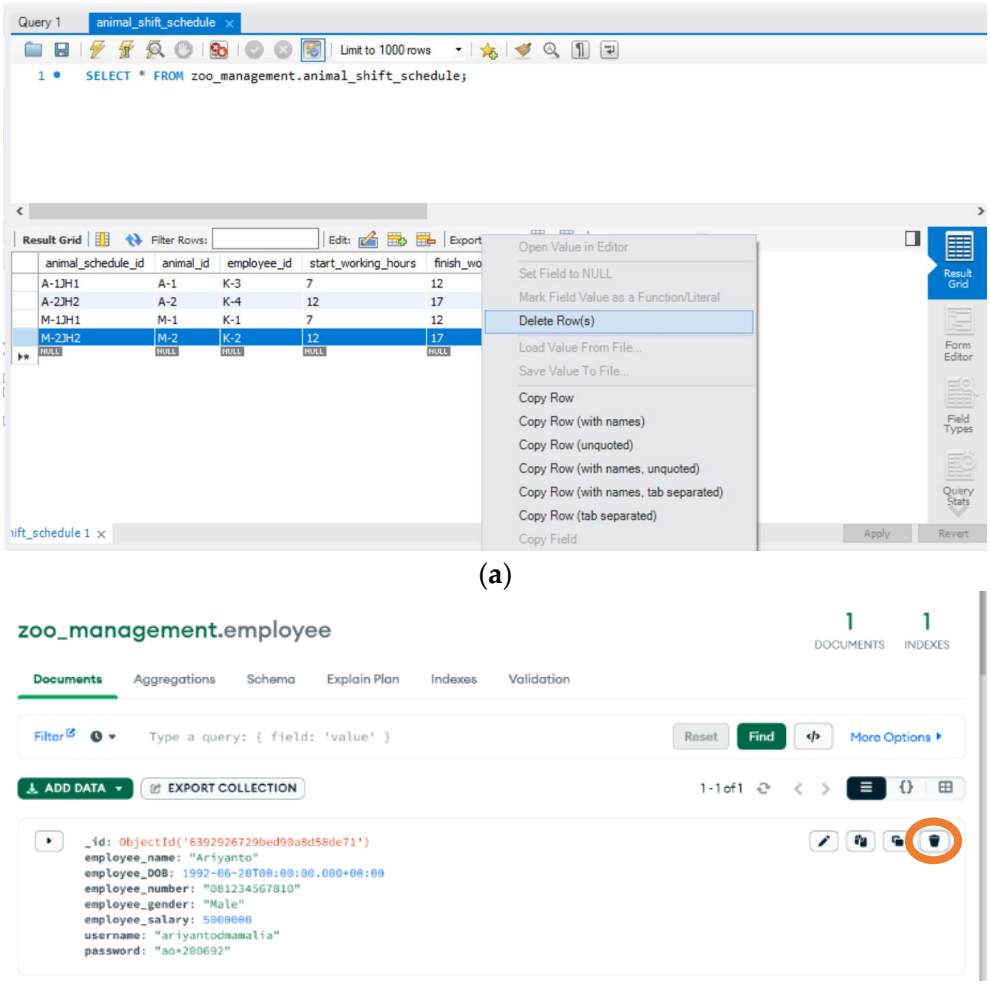




(**a**) (b)

Figure 4 Update insert data comparison. (a) Update insert data in MySQL Workbench; (b) Update insert data in MongoDB.

Delete comparison between MySQL Workbench and MongoDB.



(a)

(b)

Figure 5 Delete comparison. (a) Delete row in MySQL Workbench; (b) Delete document in MongoDB.

3.3. Relational Based on Type of Database

Based on its type, the MongoDB database is a non-relational database which does not have an entity relationship in data processing, but has key-value pairs. While the MySQL Workbench database is a relational database type that has a Primary and Foreign key. Of course, it must have an entity relationship between tables to manage the information stored.

3.4. Query Performance Comparison

MySQL workbench is a relational database system meanwhile MongoDB is non-relational database system. This significant difference will give a big impact on their query performance. An experiment test is conducted on 205451 data with some basic queries to see the difference of execution time on the query inputted. The queries are read, count, and update. All the query from experiments conducted is shown in Table 3.

Table 3 Basic queries for experiment

Query	MySQL Workbench	MongoDB
Read	SELECT * from animal where animal_category = “Aves”;	db.Animal.explain(“executionsStats”). find({animal_category: “Aves”})

Count	select count(*) from animal where animal_category = “Aves”;	db.Animal.explain(“executionsStats”). count({animal_category: “Aves”})
Update	update animal set animal_category = “Mammal” where animal_category = “Aves”;	db.Animal.updateMany({ animal_category: “Aves”}, { $set: { animal_category: “Mammal”}}, { explain: true})
Delete	delete from animal where animal_category = “Aves”	Db.Animal.explain(“executionStats”). Remove({animal_category:”Aves”})

Comparison of execution time between MySQL Workbench and MongoDB is shown in figure (6). It is proven that MongoDB execution time is much shorter than MySQL Workbench execution time for some basic queries. Based on the experiment, MongoDB shows several times better result.

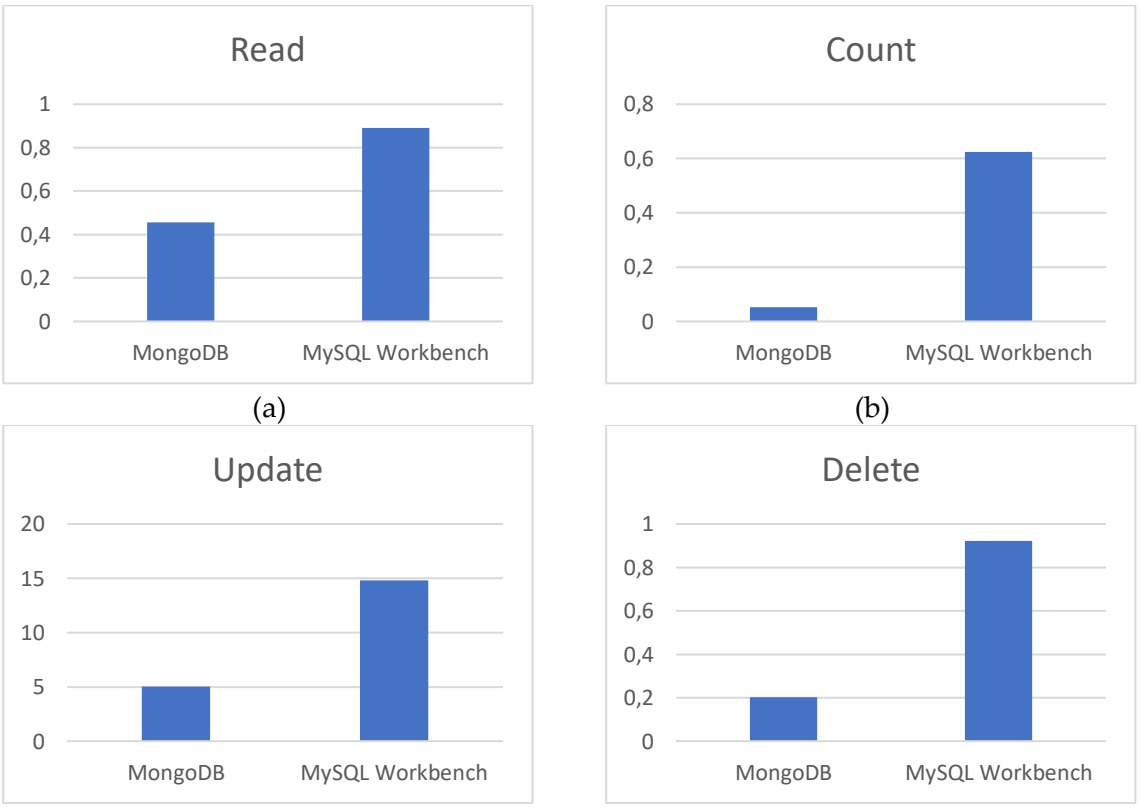


Figure 6 Execution time comparison. (a) Execution time comparison for read query; (b) Execution time comparison for count query; (c) Execution time comparison for update query; (d) Execution time comparison for delete query.

Table 4 Execution time takes

Query	MySQL Workbench (second)	MongoDB (second)
Read	0.891	0.455
Count	0.625	0.053
Update	14.813	5.025
Delete	0.922	0.203

Table 4 shows execution time take for each tool. In read query, MySQL Workbench took almost two times longer than MongoDB. In Update query, MySQL Workbench took almost three times longer than MongoDB and there is significant different for count query due to MySQL Workbench took almost 12 times longer than MongoDB. This experiment is only for 200000 more data, but it will impactful much more for bigger data and based on query performance, MySQL Workbench is inefficient than MongoDB.

4. Conclusions

Based on analyze about the GUI, each has a purpose and function that is adjusted to the type of database. However, MongoDB compass looks more modern, interactive, and easy to look at. Whereas MySQL Workbench is more structured and has a conventional impression. In terms of CRUD comparison, MongoDB has advantages over MySQL Workbench. MongoDB doesn't need to define the schema and supports rich data model, dynamic schema, data locality, and auto-sharding. In terms of query performance, MongoDB can execute queries much faster than using MySQL Workbench especially for big data. So, MongoDB has better and more efficient performance.

References

[1] S. Nogo and D. Vasiljević, "Mechanism for Migrating Data in Relational Databases," *7th International Scientific Conference Technics and Informatics in Education,* pp. 198-202, 2018.

[2] R. J. Sholichah, M. Imrona and A. Alamsyah, "Performance Analysis of Neo4j and MySQL Databases using Public Policies Decision Making Data," *7th International Conference on Information Technology, Computer, and Electrical Engineering (ICITACEE),* pp. 152-157, 2020.

[3] M. J. Aqel, A. Al-Sakran and M. Hunaity, "A Comparative Study of NoSQL Databases," *Bioscience Biotechnology Research Communications,* vol. 12, no. 1, pp. 17-26, 2019.

[4] A. Chauhan, "A Review on Various Aspects of MongoDb Databases," *International Journal of Engineering Research & Technology (IJERT),* vol. 8, no. 05, pp. 90-92, 2019.

[5] M. Eyada, W. Saber, M. M. El Genidy and F. Amer, "Performance Evaluation of IoT Data Management Using MongoDB Versus MySQL Databases in Different Cloud Environments," *IEEE Access,* vol. 8, pp. 110656-110668, 2020.

[6] M. Tyulenev, A. Schwerin and A. Kamsky, "Implementation of Cluster-wide Logical Clock and Causal Consistency in MongoDB," *SIGMOD'19,* pp. 636-650, 2019.

[7] M. Sharma , V. D. Sharma and M. M. Bundele, "Performance Analysis of RDBMS and No SQL Databases: PostgreSQL, MongoDB and Neo4j," *3rd International Conference and Workshops on Recent Advances and Innovations in Engineering,* pp. 1-5, 2018.

[8] V. Ardiyansyah, S. Budiman and F. Fadhila, "Analisis Performa Kecepatan MySQL dan NoSQL pada Sistem Operasi Windows dan Linux," *JNANALOKA,* vol. 2, no. 1, pp. 21-26, March 2021.

[9] M. Silalahi and D. Wahyudi, "Perbandingan Performansi Database MongoDB dan MySQL dalam Aplikasi File Multimedia Berbasis Web," *CBIS Journal,* vol. 06, no. 01, pp. 63-78, 2018.

[10] A. Junaidi, "Studi Perbandingan Performansi antar MongoDB dan MySQL Menggunakan PHP dalam Lingkup Big Data," *Seminar Nasional Teknologi Informasi dan Multimedia,* vol. 5, no. 1, pp. 49-53, 2017.