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Role of Database System in Education

Yashwant Rao, Akanksha Kulkarni

PG Student, Dept. of MCA., Ajeenkya D Y Patil University Pune. Maharashtra, India

Professor, Dept. of MCA., Ajeenkya D Y Patil University Pune. Maharashtra, India

ABSTRACT: Database Management System (DBMS) is a very important concept is any from small to major organization or educational institute. Database system plays a crucial part in fostering students' enthusiasm in educational field. The researchers have developed a number of various teaching aids and techniques over many years and have also been evaluating database systems educational policy. The report contains suggestions to further this research from many angles and offers helpful guidelines for the faculty members. To the best of our knowledge, this is the first study to offer a detailed summary of the Database system research in education that has been done.

KEYWORDS: Database, Database system, COVID-19, Digital Educational Coordination System

I. INTRODUCTION

Mobile If ask about what is Database Management System (DBMS) means then it is a tool for organizing of data within the organization or institutions. The Educational Institutions has the capacity to implement of various actions on the database system i.e., manipulation of huge data within the institution's Database system.

The amount of data all around the world is day-by-day increasing. So for this many organization and education institutions are applying various new technology to manage the huge data flow the database.

Whereas in India, the data analysis of higher education (college) stood at 42,343 in the year 2020. As of August 23, 2022, the number of universities in India stood at 1,057. India had 38.5 million students enrolled in higher education in 2019-20, with 19.6 million male and 18.9 million female students. In FY20, Gross Enrolment Ratio (GER) in Indian higher education was 27.1%[12].

To administer the this much amount of data of student educational institutions invest heavy amount in maintaining the database by using the Database Management System Software (DBMS) that is cloud based software (IBM DB2, Oracle, etc.) [Figure 1 and 2] which are every easy to manipulate the data such as updating, deleting or accessing the data as per need. It reduces possibility of Human error in managing the database in the organization.

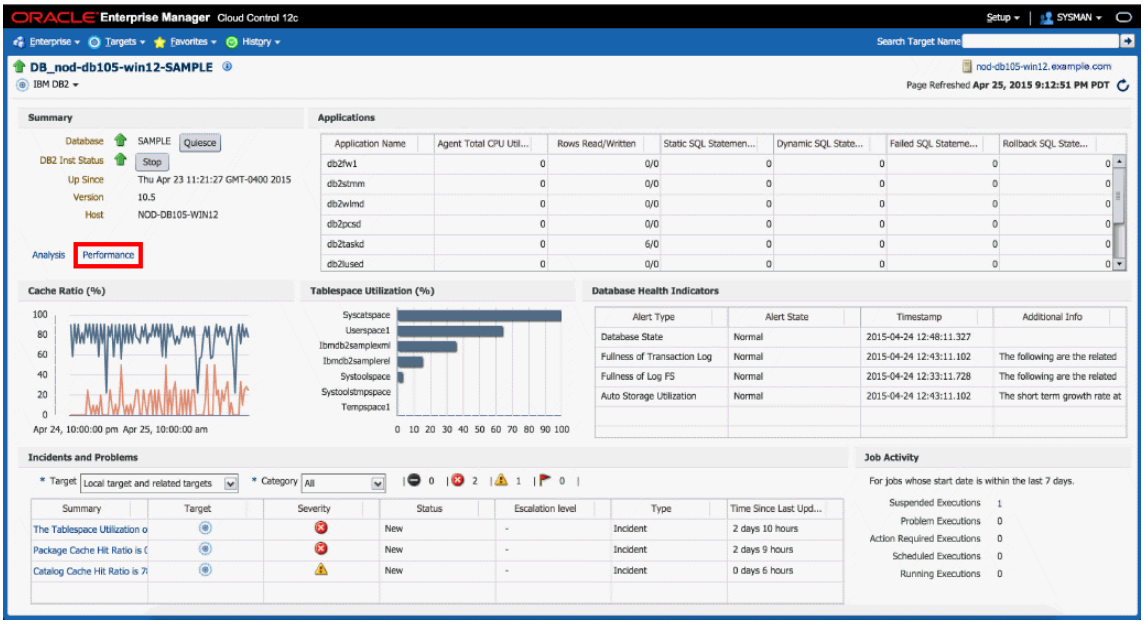

Figure 1: IBM DB2 cloud software

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Figure 2: Oracle Database

So this research is for understanding the working or how the organization manages the database and what were the challenges faced during the pandemic? and How they found the solution to counter it?

II. RELATED WORK

In Systematic Literature Reviews have proven to be an extremely useful artefact for capturing and capable of understanding a domain. A number of intriguing review studies in various fields have been discovered. Narrative or traditional, systematic literature reviews, and meta reviews or mapping studies are the most common types of review articles. This study presents a systematic review of the literature on database system education[6][7].

Database systems education has been considered from a variety of aspects, including teaching and learning methodologies, curriculum reform, and the assistance of students and educators through all the development of various tools. For example, a number of research articles focusing on designing tools for learning database systems courses have been published[6]. Furthermore, a few writers have examined DSE tools through surveys and observation to determine their usefulness and level of acceptance among key stakeholders, instructors, and students. On the other side, various case studies have been reviewed in order to assess the efficacy of the improved methodologies and produced tools[6][7].

Regueras in 2007, for example, presented a case study using the QUEST system in which e-learning strategies are used to teach the database course at the college level, whereas Myers and Skinner (1997) recognized conflicts that arise when theories in textbooks regarding database development do not work on specific applications[6].

There are further research that focus on different features of DSE, such as customized tools for specific areas. For example, performed a survey about employing cutting-edge software tools to teach advanced relational database design classes at Cleveland State University. Similarly, Nelson and Fatimazahra in 2010 did a review to highlight the importance of learning basic database knowledge for students in the computer science area as well as those in other domains[5].

Martin et al. did another significant study that focuses on collaborative learning strategies to teach the database course in 2013 This study looks at constructivist teaching strategies and how they may be used to the fundamental database course at the Barcelona School of Informatics. The authors' goal was to provide active learning strategies to increase learning and stimulate competence acquisition. However, the study focused primarily on a few ways for

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teaching database systems, while other essential viewpoints, such as database curricula and tools for teaching DSE, were not addressed[5].

The Digital Educational Coordination System is tasked with keeping faculty, student, and university information. Digital Educational Coordination System project, student information was automated so that it could be used in various college administrations. It gathers pertinent data from all educational institution areas and keeps data that are used to produce reports in a variety of formats to assess individual and collective performance.

III. METHODOLOGY OF SELECTION OF DATABASE IN EDUCATION

A database selection approach takes numerous aspects into account. The first question to ask is whether a database is even necessary. This question must be answered before moving on to the next phase in a methodology. If the company's decision involves an existing database and whether or not it has to be replaced, the question is whether it really needs to be replaced [6][7]? Another element to consider while developing a methodology is whether to build or acquire a database. A cost-benefit analysis is required. This can be a significant step in the technique of smaller businesses and non-profit organisations.

For most enterprises, this serves as the second phase in a system. The question of whether or not the database will assist the company in making more money is essential. This stage must be considered early in the approach of examining database selection. Will the database support the company's mission-critical activities? The database must be capable of supporting operations that generate revenue for a business or allowing that organisation to function[7][8]. These aspects must be considered early in the database selection process. The answers to these questions will influence whether or not a corporation proceeds with the database selection process. Another element to examine is what the database's purpose is. A database is a type of computer system that stores data, tracks transactions, and generates reports. The goal could be a combination of these many functions. A corporation must consider what purpose the database will serve within the organisation. This function will assist in demonstrating the database's purpose to the company. Choosing the goal is an important component to consider in every institution's database selection approach[6][7][8].

The pricing is a crucial consideration that any firm will consider when selecting a database. The price of a database system is higher than the sales price, and the cost of developing the system is higher than the cost of developing the system. After the organization has purchased or built the system, it needs locate skilled employees to run it. This is a significant expenditure that must also be considered. One must generate documents and reports, someone must construct new databases, one must troubleshoot, and so on. The license's ongoing costs must be considered into the cost portion of the study[8][6].

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Table 1 Comparison with other related research articles

Study	(Mcintyre et al., 1995)	(Myers & Skinner, 1997)	(Beecham et al., 2008)	(Dietrich et al., 2008)	(Reguera et al., 2007)	(Nelson & Fatimazahra, 2010)	(Martin et al., 2013)	(Abbasi et al., 2017)	(Luxton-Reilly et al., 2018)	(Taipalus & Seppänen, 2020)	This article
Focus	Database	Database	Software Engineering	Database	Database	Database	Database	OOP	Programming	Data Base	Database System
Research Types Classifications	-	-	-	-	-	-	-	-	-	✓	✓
Teaching Methods	-	✓	-	-	-	-	✓	-	✓	✓	✓
Tools to aid teaching	✓	-	✓	✓	✓	✓	-	✓	✓	✓	✓
Curricula considered	-	-	-	✓	-	-	✓	-	✓	-	✓
Evolution	-	-	-	-	-	-	-	-	-	-	✓
Year	1995	1997	2008	2008	2009	2015	2013	2017	2018	2020	2022

To maintain the primary goal of this study, which is to examine research in the field of database systems education, a piece of guidance has been gathered from existing approaches presented in many studies (shown in Table 1)[8]. This research showed the look for pertinent papers As a result, adequate research objectives were developed, and relevant research questions and a search method were developed as a result.

IV. USAGE OF CLOUD TECHNOLOGY

Over the past few years, the education has improved a lot during the COVID-19 pandemic. At first, we use to have textbooks and classrooms and now we are using the internet and mobile phones. Now-a-days technology plays a huge role in the day-to-day life and learning.

Due to COVID-19, who might have thought that eLearning (cloud technology) we are connected to the educational institute which are located hundreds of miles away. Cloud technology shifts the physical resources to virtual ones.

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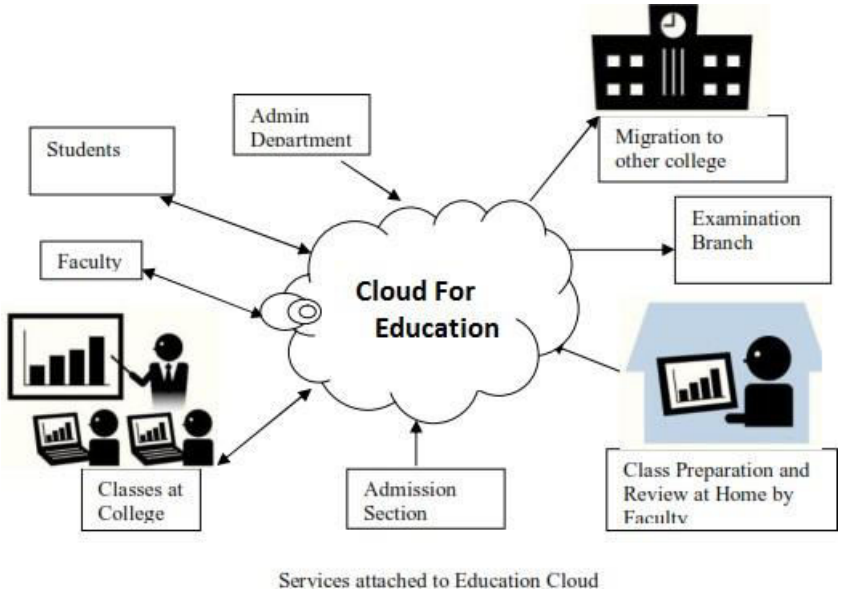

Figure 3: Diagram of cloud technology

Nowadays, it is essential that student's complete class having mastered key abilities such as the capacity to create, engage, make judgments, and collaborate verbally. Cloud computing is one method for encouraging a culture of creativity in schools[9]. Cloud computing provides potential for classroom creativity and advantages that are both secure and affordable.

A. Educational Sector Innovation –

Cloud computing creates new options over all users. Teachers can connect their students by using the cloud software (zoom, Microsoft teams, etc.). And it also allows the students to be creative in their presentation reports and interactive sections. A student, for example, could submit the assignment by uploading a recorded video, sharing a document they worked on with their peers. The cloud allows students to use their voice and choice in how they exhibit their learning, and it allows them to use a variety of tools to do so.

B. Cloud Security Services –

Cloud computing provides various security services to safeguard the data of the students. The cloud vendors invest time and money to create the infrastructure for security services

C. Reliable Cloud-Based Collaboration –

Students must master the skills necessary to work well with others. The cloud provides all users with easy access to resources across many platforms, laying a solid foundation for the development of collaborative abilities.

D. Better reach for students –

The use of cloud computing in the field of education gives organization the chance to broaden their experiences. Individuals who are frustrated with conventional educational methods can now investigate the emerging idea of online education. This is fantastic for individuals who wish to choose remote learning or even study abroad. Working professionals who wish to advance their abilities but are unable to attend traditional classes can also enroll in online courses. Cloud technology has here, from simple online tools for students to create and take notes together to complex systems for project collaboration. Teachers and students are both active participants. Examples of cloud computing in education:

1) electronic diaries, magazines
2) personal accounts for students and teachers
3) interactive reception area

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4) thematic forums where students can discuss information: End.

V. CHALLENGES FACED IN DATABASE SYSTEM AND ITS SOLUTION

The increased focus on quarantine during the coronavirus pandemic has expedited the acceptance of internet commerce and remote employment. Many small firms have decided to digitalize, and they are quickly moving to the cloud. According to Research and Markets, the worldwide DBMS market was expected to have reached $63.9 trillion in 2020 and is projected to reach $142.7 trillion by 2027. The market for database management systems is expanding rapidly[13].

Organizations are increasingly integrating their data assets and warehouses into cloud storage platforms. A Database Management System (DBMS) is necessary for working with a wide variety of new data types while moving to the cloud[13].

The Challenges faced by the educational institutions are as fellows[figure 4] :

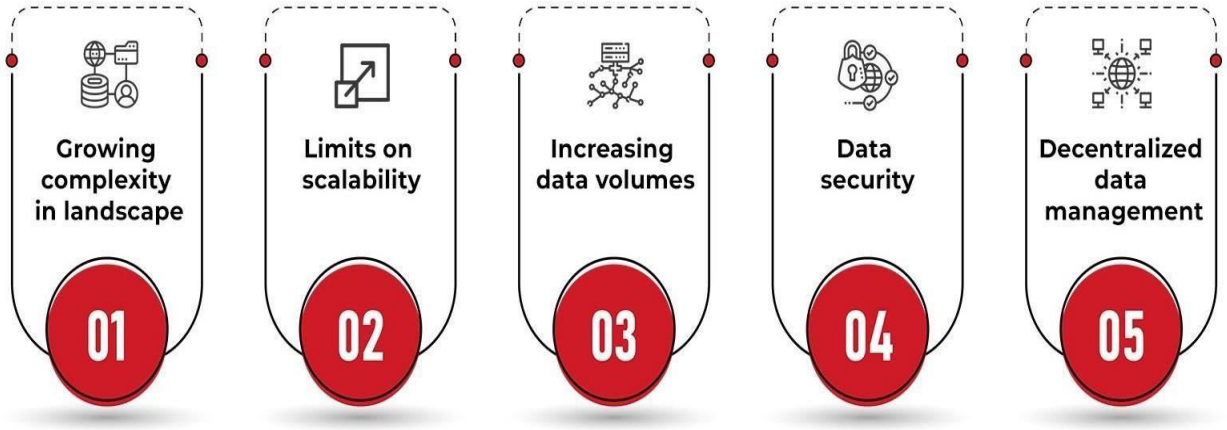

Figure 4: Database Challenges

1. Landscape complexity is increasing:

This was hinted at earlier. The database market is changing, and many businesses are finding it challenging to assess and select a solution. There are several types of databases, including relational, columnar, object-oriented, and NoSQL. Not to mention the abundance of vendors each offering a unique take on the others.

2. Scalability restrictions:

The truth is that every software, including database servers, has scalability and resource utilization restrictions. Companies who are proactive and concerned about transaction processing capacity are aware that scalability is influenced by cataloguing elements, database design, operating systems, and even hardware configuration.

3. Volume of data growing:

Companies are finding it challenging to keep up with the explosion in data generation and collection. According to research, we have produced more data in the last two years than the whole human race combined. However, a typical Fortune 1000 business could earn with over $65 million more in net income with something like a 10% increase in data accessibility.

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4. Data Security:

The unseen workhorses of many businesses' IT infrastructures are their databases, which store vital private and public data. Data security has recently received understandable and prominent attention. An average data breach costs a educational institutions $4 million, not including damage to its goodwill and credibility.

5. Decentralized management of data:

Decentralized data management offers advantages, but it also has drawbacks. How will the information be dispersed? What decentralization technique works the best? What level of decentralization is ideal? The inherent absence of centralized knowledge of the complete database is a significant challenge when developing and operating a distributed database.Fig 4. Energy Consumption by Each Node

VI. CONCLUSION

According to Kelly J. Calhoun Williams, vice president analyst at Gartner, personnel working in smaller school districts are frequently stretched thin and unable to devote adequate time to the IT and data side of education. While the pandemic has made it tough to reach children and ensure that they are learning, it has also made data management even more challenging for local districts[10]. The epidemic and the rapid increase in data collecting from children in a digital classroom setting are putting a strain on larger districts. They are, nevertheless, in a stronger position due to their larger pool of resources[10][11].

In the education department enjoys having a specific individual or department handle data since it frees up other employees to focus on their own jobs and allows them to spend time improving children' education. Any district that commits sufficient resources to gathering and trying to assess student data will have a better likelihood of comprehending the effectiveness of their educational process. Teachers must adopt a new strategy while being effective in an uncertain society. Teachers have always used educational management systems for years to keep and evaluate data points such as exam results and attendance. However, teachers must now track student participation in addition to coursework and tests. On top of that, since everything is moved online, there is an extra layer of privacy concerns[11].

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