Lack of it Infrastructure for ICT Based Education as an Emerging Issue in Online Education

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Abstract

Technology evolves everything around the world and it has the capability to improve the learning process among students globally. IT infrastructure is the main key to success in the field of emerging ICT-based online education systems. Proper implementation of IT infrastructure helps to improve online education systems worldwide. Implementation of IT infrastructure increases access to technology and also enhances the efficiency of the online education system. A well-structured IT infrastructure helps students to make communication with teachers and other learners more efficiently and that is important in the ICT-based education system. IT infrastructure also improves the ICT-based learning process and that is important to improve skills and innovative ideas among the learners. This study aims to investigate where the existing IT infrastructure is lacking and how it can be solved to get better results in the field of ICT-based online education systems. This research also emphasises the multiple benefits of implementing proper IT infrastructure to improve the effectiveness of the online learning process. The secondary qualitative data collection and analysis process is followed in this research to make this research time efficient and relevant. Thematic analysis of the lack of IT infrastructure and its effect also gives an insightful overview about the issue also provides different strategies to overcome these issues.

Keywords

Education, ICT-based education, Information technology, infrastructure, IT infrastructure, learners, online education, online platform, students,

INTRODUCTION

ICT-based education is a form of education that uses "Information and communication technology" to improve the online learning process and it totally depends on the IT infrastructure. It is an emerging concept of education that has been evolving since the time of the Covid-19 outbreak [1]. Different research shows that ICT-based online learning processes face some issues in IT infrastructure and that affects the online education system significantly. ICT-based education can improve the overall quality of education and ultimately gives benefits to the students. Different surveys show that students who are continuously exposed to technology and using ICT-based online learning platforms have better presentation skills, knowledge and innovation capabilities. Improvement in IT infrastructure has the capability to improve the ICT-enabled education system [2]. This study aims to identify the lack of IT infrastructure and its impact on ICT-based education.

AIM AND OBJECTIVES OF THE STUDY

Online education and ICT-based education systems totally depend on the IT infrastructure and lack of IT infrastructure is the main issue at present time. The aim of the study is to identify the lack of IT infrastructure and its impact on the ICT-based education system.
- To identify the role of IT infrastructure in ICT based online education system
- To understand the key benefits of implementing IT infrastructure in ICT based education process
- To determine the lack of IT infrastructure and its impact on ICT-based online education system
- To identify the different strategies to improve IT infrastructure in ICT based online education system

RELEVANCE OF THE STUDY

Technology is revolutionises the education sector worldwide and the main pillar of the process is digitisation and improvement in IT infrastructure. ICT-based education is a trending form of education that is widely used among students globally. Students from different backgrounds and different classes are uses ICT based education system to improve their knowledge and skill. ICT-based education totally depends on the IT infrastructure and the effectiveness of the online education system can be maximised by improving the IT infrastructure. Without proper implementation of IT infrastructure, ICT-based education can not be improved. On this note, understanding where the IT infrastructure is lacking is very significant for improving the ICT-based online learning process. This research aims to identify where the IT infrastructure is lacking and what are the major impacts of IT infrastructure on improving the online education system. Hence, it is relevant to perform research in this context to improve the online learning process worldwide.

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MATERIALS AND METHODS

Research design

"Research design" is an integrated part of research methodology that is important to formulate and structure the overall research process. The "research design" provides a systematic overview of the research that helps to improve the overall functioning of the research [3]. It helps to form an outline of the research to make the research study time efficient and effective. The *"exploratory research design"* is adopted here among the different research designs to get benefits in this research. The exploratory research design is followed in this study through secondary qualitative data collection that makes the research study more time efficient and improves the relevance of the study.

Research type

The overall relevance of research significantly depends on an effective selection of research type. A relevant research type can improve the productivity of researchers and that helps to improve the relevance of the study. "Qualitative and quantitative research" are the two main types of research that are widely used by researchers [4]. It gives a strategic way to perform research studies efficiently. The *"qualitative research type"* is followed here in this study to enhance the potency of the research. Besides, it also gives a clear understanding of where the IT infrastructures are lacking and affects the ICT-based online education system.

Research philosophy

A philosophical perspective is essential to perform an effective and fruitful research study and it is an integrated part of the research methodology. A proper philosophic view gives an insight into the understanding of the research topic and also helps to enhance the knowledge about the research topic [5]. Among the different research philosophies, the *"Interpretivism research philosophy"* is adopted in this study to improve the overall understanding of the lack of IT infrastructure for ICT-based education systems. The "interpretivism research philosophy" helps here in this research to give an insightful overview of the issue and also enables researchers to make different strategies to overcome the emerging issue in It infrastructure that affects the ICT-based education system.

Inclusion and exclusion criteria

"Inclusion and exclusion criteria" are the most important part of the data collection process and it helps to improve the overall effectiveness of the research.

Inclusion criteria
- Authentic and relevant journals, articles, newspapers and websites are taken here in this research to collect data.
- Journals and articles that have authentic authors and publication dates have been chosen here to collect data.
- Sources that were published before 2018 are selected here for data collection

Exclusion criteria
- Journals, articles and newspapers that were published before 2018 are avoided for data collection.
- Blogs, personal articles and sources that are written in other than the English language are also excluded for the data collection procedure.

Data collection and analysis

"Data collection and analysis" is an integral part of research and the overall effectiveness of the research depends on the proper data collection and analysis procedure. There are different types of "data collection and analysis processes" in the field of research. The *"qualitative data collection and analysis process"* is followed during the research. It gives an adequate understanding to the researchers to maximise the significance of the study [6]. The "secondary qualitative data collection and analysis" gives a clear understanding of the lack of IT infrastructure in the field of the ICT-based education system. It also makes research study time efficient with effective outcomes. The thematic analysis about the lack of IT infrastructure in improving the ICT-based modern education system provides insightful learning and also helps to make a blueprint to avoid the issues.

RESULTS

Role of IT infrastructure in ICT-based education system

The world is changing and the learning process of students is also evolving with time through the online education system. The government of different countries' main focus is to develop online learning platforms for students by implementing ICT-based education systems. IT infrastructure has an enormous role in improving the ICT-based education process [7]. A well-structured IT infrastructure provides students with a more engaging and creative learning environment that helps them to learn new skills and share their ideas with their teachers and peer groups. IT technology helps teachers to make engaging audio-visual classes for their students and helps them to understand different topics more efficiently. One of the important roles of IT infrastructure in an ICT-based education system is to connect students with teachers and boost collaboration among the students.

IT infrastructure and advanced communication devices provide students with the opportunity to connect with teachers and ask them their study-related doubts in a relevant way and that helps to improve their understanding of different topics. Effective improvement in IT infrastructure facilitates students to make collaboration with other students and helps them to share their views and ideas among the group members. It enables them to learn different skills more prominently. Proper implementation of IT infrastructure helps students to prepare for the future [8]. Technology is the future and IT infrastructure improvement helps students to become more familiar with new technologies such as programming and other emerging technologies. It makes

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them compatible in their future professional life. Advancements in IT infrastructure also benefit the students to store their study materials in cloud storage and which helps them to access their study materials from different places around the world. It is important for students to learn from outside the classroom and learn different emerging skills from their comfortable places.

Benefits of implementing IT infrastructure in enhancing online education

Information technology changes people's lives in every aspect as technology has become more accessible to people. It has penetrated every aspect of life along with the learning process of students. There are multiple benefits to online education systems that come with the implementation of information technology (IT) infrastructure.

*Provides huge study materials that can be accessed easily:*IT infrastructure helps to build a vast library of study materials that students can access from their desired location and learn their curriculum [9]. This vast library provides students with different learning options and students can choose from them according to their educational needs. This helps to learn desired skills and get success in future.

Allows learners to access the internet from anywhere at any time: Advancements in IT infrastructure provide internet connectivity to the students and that helps them to access the internet from anywhere at any time.

It helps them to access their learning materials and connect with teachers and other students flawlessly. Well, internet connectivity also helps to organise online audio-visual classes for students of remote areas.

Helps learners to stay up to date with new technologies: Improved IT infrastructure provides students with knowledge of different technologies and makes them compatible with the trending technological market [10]. It gives them the opportunity to find a job more easily and get success in their professional life.

*Information technology makes teaching easy:*Information technology makes audio-visual classes easy and that helps teachers to explain different theoretical knowledge more efficiently and it helps students to understand the topic more easily. Using projector and computer presentation teachers can deliver any type of lesson to the students and it improves the level of comprehension within the classroom.

Helps teachers to track students' progress: Information technology and advancement in the infrastructure of IT help teachers and instructors to track students' progress conveniently and that is important for guiding students on the right path. It is also important for improving students' skills in a different field [11]. IT infrastructure also helps to build different tracking platforms to track the individual achievements of students and guide them in their educational and professional goals.

*IT infrastructure improvement makes distance learning more accessible:*In today's world distance learning is a

convenient way of learning that helps people to learn different skills to improve their professional life. Now people can learn new technologies and new skills while doing their job [12]. Different online platforms with the help of information technology provide different courses to the learners to learn their desired skills.

Lack of IT infrastructure in ICT-based online education

IT infrastructure is an essential part to perform ICT-based online education and provide students support in their overall learning process. A strong infrastructure improvement in information technology is the key to success in ICT-based online education systems. Due to the lack of IT infrastructure, the online education system faces different problems and it affects the learning process of students and professionals.

*Problems in accessing the study materials and classes online:*Due to a lack of Information technology regular and distance learners can face the issue with the accessibility of study materials. Learners can not access study materials and that may be a failure in the online education system. Due to a lack of IT infrastructure learners may face the internet connectivity issue and that can be the disruption in the online education system [13]. Sometimes due to older operating system versions students and other professionals can face difficulties in accessing high-quality study materials and online classes and this is also can be the cause of failure in the online education system.

*Lack of interaction among the learners:*Learning from a comfortable location is convenient but due to the lack of IT infrastructure learners may face a lack of interaction with the teachers and other students. This can be the cause of failure in the ICT-based online education system. Working professionals also can not interact with the teachers and that can be the cause of disturbance in their online learning programmes.

Lack of infrastructure for learners with disabilities and special needs: IT infrastructure has the ability to provide learning options to every person. Students with disabilities and special needs also can learn the curriculum and other skills of their interest with the help of advanced information technology [14]. On the other hand, due to a lack of IT infrastructure often schools, colleges and other learning platforms can not provide education to students with special needs and that can be the major cause of failure in ICT-based education systems. For example, a huge number of schools and colleges do not have enough IT infrastructure to provide online classes and learning materials for blind and deaf students. It is the major drawback of IT infrastructure in recent times and it is also a major reason behind failure in the online learning process.

Technical glitches due to poor IT infrastructure: Technical glitches in online platforms are a common issue in ICT-based online education systems. Due to a lack of IT infrastructure and poor security systems in online learning platforms, students face multiple glitches and security-related threats [15]. Often students face problems accessing classes

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and study materials on online platforms. These issues may be the main cause of failure in the ICT-based online education system.

Strategies to improve IT infrastructure in ICT-based education system

TheICT-based online education system is the most convenient and effective way of learning among regular and distance learners and information technology is the backbone of IC-based online education. The online education system can be improved by improving IT infrastructure. Schools, colleges, other institutes and the government of every country have to improve IT infrastructures to give benefits of ICT-based online education system to the learners. High-quality wifi, 5G and 4G services need to be implemented in different locations of the country to provide flawless internet services to students and working professionals [16]. Telecom and wifi service providers need to upgrade their services on time to time basis to provide customers with quality internet service and also they need to provide internet to students and working professionals at a discounted rate to give them the opportunity to access online classes without any problem.

Different multinational technical companies also have to provide cloud-based storage services at discounted rates to the students to store their lecture videos and study materials. It gives students opportunities to access their study materials from their desired locations. Schools, colleges and government bodies have to aware students and other professionals of digital services to improve digital literacy among them and that helps them to learn different skills from online platforms [17]. The ICT-based online education system can be improved by providing students glitch and problem-free online platforms. In order to do that online platforms need to upgrade their services time to time basis through IT infrastructure improvement. IT services and infrastructure have to improve to give provide online education to students with disabilities and special needs.

Online platforms, schools and colleges have to make different online learning materials for students with disabilities to educate them with new technologies and skills by improving IT infrastructures. Information technology infrastructure can be improved by securing students from online fraud and cyber criminals [18]. Online education service providers need to introduce different security elements in their servers to protect learners from online data thefts and other cyber threats. Schools, colleges and other educational institutes have to protect their computers by installing different anti-virus and anti-malware software to protect their study materials and educational files from cyber attackers. Hence, it can be stated that ICT-based online education needs to work on different IT infrastructural changes to improve online education services and give benefits to learners.

DISCUSSION

The world is evolving and the learning process of students is also changing with the advancement of information technology. The overall education system of students and working professionals can be improved by ICT-based online education and the main factor in improving the online education process is IT infrastructure improvement. The information technology infrastructure has a huge role in improving the ICT-based online education system. A well-structured IT infrastructure provides students with a more engaging and effective learning environment that helps them to connect with their teachers and other students [19]. It provides them with the opportunity to discuss different study-related topics with students from other countries and locations. IT infrastructure improvement helps teachers and education service providers to make engaging audio-visual classes and effective study materials.

Effective IT infrastructure improvement helps students to make collaboration with other students and it is helpful for them to discuss different study-related topics and ideas with others. IT infrastructure and advanced communication devices enable students to connect with their teachers and ask them for different solutions to their doubts. It improves the overall learning process of students and gives them benefits in the educational field and professional fields as well. IT infrastructure advancement helps students to familiarise themselves with different new technologies and learn them to get an advantage in the later future [20]. It helps them to learn different trending programming languages and that is important for them to get an advantage in their professional life. There are different benefits of improving IT infrastructure in ICT-based online education systems.

IT infrastructure advancement provides students with a huge library of study materials and enables them to access these study materials from their desired locations. This huge library of study materials gives students huge options for learning and enhances their skills. IT infrastructure advancement enables students to access the internet from different locations and learn different skills from the internet. It also gives learners an opportunity to stay up to date with new technologies and get an advantage in the competitive professional market. IT infrastructure improvement also enabled teachers to track students' progress in a convenient way and also it helps teachers to teach students in a significant and easy way [21]. IT infrastructure advancement makes distance learning easier and with the help of advanced, ICT-based online education people can learn different extra-curricular skills of their interest with their job.

Different online platforms provide different courses and learning options to working professionals and help them to get benefits in their professional life. On the other hand, ICT-based online education systems are lacking in IT infrastructures which are also deciding factors in online education systems. Due to a lack of IT infrastructure students faces difficulties in accessing study materials from online sources. Often it reduces the interaction among the learners

and ultimately affects the overall learning process among the students. Due to a lack of IT infrastructure schools, colleges and other learning platforms cannot provide learning options to students with special needs and it obstructs their way to success [22]. Lack of IT infrastructure increases the technical glitches in online learning platforms and that is also a significant cause of failure in ICT-based online education systems.

The information technology infrastructure can be improved by implementing different strategies. Infrastructure can be improved by introducing high-speed internet facilities and cloud storage services. Telecom companies and other technology companies can provide valuable internet services and cloud-based storage services to customers to improve the overall learning process of the students [23]. Advanced IT infrastructure can provide glitch and problem-free platforms to the students to improve their learning experience. Online education service providers, schools and colleges can implement different security software to provide data-related security to the students and it improves the overall learning experience of the students and protect them from different online cyber threats.

CONCLUSION

ICT-based online education is evolving in the last few years and it becomes the future of education worldwide. The online education system totally depends on the information technology infrastructure. Proper implementation of IT infrastructure can improve the online education system worldwide. IT infrastructure can improve the learning process of students and also helps teachers to track students' progress. The effective IT infrastructure advancement provides students more engaging learning environment and it also enables students to access their study materials and audio-vidual classes from their desired location. There is a wide range of benefits in implementing the IT infrastructure in an ICT-based online education system. Infrastructural advancement gives learners the opportunity to access the internet from any location and learn their skills in a convenient way. Infrastructural advancement in information technology has the capability to introduce learning materials for students with special needs and it helps to educate them with multiple extracurricular skills. The online education system can be improved by advancing IT infrastructure and the infrastructure can be improved by introducing high-speed wifi,5G and 4G services. It gives opportunities to learners to access their educational files from anywhere in the world. Online education service providers, schools, colleges and other institutes can implement different security software to protect students' data from cyber criminals and it is an effective strategy to improve IT infrastructure in ICT-based online education systems.

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